



BULGARIA

ROADS INFRASTRUCTURE AGENCY

Development of a Comprehensive Vision for the Introduction of the Electronic System for Provision of the European Electronic Toll Services

Development of Strategy and Business model for the implementation of the Electronic System for the provision of EETS and financial planning document

October 2015



European Union



EU Structural Funds



THE WORLD BANK

FISCAL YEAR

January 1 – December 31

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Acronyms

| | |
|----------|---|
| AADT | Annual Average Daily Traffic |
| AETIS | Association of Electronic Toll and Interoperable Services |
| ANPR | Automatic Number Plate Recognition |
| CCTV | Closed-Circuit Television or video surveillance |
| CEDR | Conference of European Directors of Roads |
| DSRC | Dedicated Short Range Communications - a “tag and beacon “ based tolling system with roadside infrastructure |
| ECMT | European Council of Ministers of Transport |
| EDRA | European Debt Recovery Agency |
| EETS | European Electronic Toll System - as defined by EU Directive to allow for interoperability between Toll systems |
| EP | EETS Provider |
| ETC | Electronic Toll Collection |
| EUCARIS | European CAR and driving license Information System |
| GIS | Geographic Information System |
| GNSS/ CN | Global Navigation Satellite System / Cellular network. A toll system that uses satellite systems such as Galileo or Global Positioning System so the vehicle can calculate its location, and cellular networks to send this location onwards to calculate tolls |
| HDM | Highway Development and Management Model |
| HGV | A vehicle typically of greater than 12 tonnes MPGVB |
| ISO | International Standards Organization |
| ISP | Independent Service Provider - an organization that provides a customer interface with the toll service |
| IT | Information Technology |
| MEU | Mobile Enforcement Unit - a vehicle that monitors compliance with tolling |
| MPP | Master Project Management Plan |
| MPGVW | Maximum Permitted Gross Vehicle Weight |
| NPV | Net Present Value |
| NRA | National Revenue Agency |
| NSP | National Service Provider |
| NUTS | Nomenclature of Territorial Units for Statistics |
| OBU | On Board Unit - a device in a vehicle to locate its position and pass this onwards for collection of tolls and/or fleet management purposes. Typically uses GNSS |
| OD | Origin and Destination Pair |
| KPI | Key Performance Indicator - a contractual measure of success of the outputs from a project - for example % vehicle accuracy or number of complaints |
| PFI | Private Finance Initiative |
| PMBOK | Project Management Body of Knowledge (American Standard ANSI/PMI 99-001-2013) |
| PMP | The Contractor’s Project Management Plan |
| PPL | Public Procurement Law |
| PPP | Public Private Partnership |
| REETS | Regional EETS - a project looking at a subset of EETS in EU regions |

| | |
|-------------------|--|
| RIA | Road Infrastructure Agency |
| Salzburg Forum | A cooperation initiative between the Interior Ministries of eight European countries |
| SPE | Special Purpose Entity |
| STMS | Strategic Traffic Management System |
| ToR | Terms of Reference |
| TP | Tolling (data) Provider |
| VMS | Variable Message Sign |
| VOSI | Vehicle of Special Interest |

| | |
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DISCLAIMER

This report is the product of the staff of the World Bank. The findings, interpretations, and conclusions expressed in this report do not necessarily reflect the views of the Executive Directors of the World Bank or the governments they represent. The report was produced to provide advisory support for the Road Infrastructure Agency (RIA) and does not necessarily represent the views of Government of Bulgaria or of the RIA.

Executive Summary: National Tolling Framework for Bulgaria

1. The Road to a Sustainable Road Network in Bulgaria

Bulgaria ranks 102nd out of 148 countries in the quality of its infrastructure, as per the 2013-14 World Economic Forum's Global Competitiveness Report. This reflects long term chronic underfunding in the national roads system as Bulgaria has extensive road maintenance and upgrade needs, which hinder the required economic growth. The Road Strategy of Bulgaria hence recognizes the importance of maintenance, mobility, safety and connectivity in accordance with EU directives to help sustainable transport for stronger European integration.

Currently, revenue from vignettes is insufficient for maintaining the road network, let alone future investments. The Road Strategy shows that Government faces challenges to finance construction and required rehabilitation of all existing roads and bridges within 5 to 7 years. There is a critical need to ensure long-term predictable funding to allow a meaningful, consistent and sustainable roads policy to be deployed. This requires additional investment of at least 400M BGN of net revenue per year.

This project's journey started by Deliverable 0, which initiated analyses of numerous road network technology and coverage options. They ranged from distance-based tolling for all vehicles to keeping the current model, including various combinations of road network and technology solutions. Out of this initial analysis, following consultations with the MRDPW and REA, several feasible procurement options were proposed that best meet policy goals, while being practical and financially viable. The indicative results of different options are shown below in terms of projected annual net revenue. The options that could generate over BGN 400 million are shown in green. These results were then used to narrow down and further fine tune the options.

| Policy Options - Net Revenue [Mio. BGN] | | | | | | | |
|--|-----------------------------------|--|------------|---|------------|------------------------|------------|
| Minimum BGN 400 Mio. is needed for effective Road Infrastructure Financing | | | | | | | |
| | Baseline - Current Vignette | E-Tolling HGV + buses and Current Vignette Light Vehicles + Passenger Cars | | E-Tolling HGV + buses and E-Vignette Light Vehicles + Passenger Cars | | E-Tolling All Vehicles | |
| | | DSRC | GNSS | DSRC | GNSS | DSRC | GNSS |
| motorway | 200 | 218 | non viable | 252 | non viable | 232 | non viable |
| motorway + 1st class roads | | 392 | 464 | 417 | 488 | 444 | -421 |
| motorway + 1st + 2nd class roads | | non viable | 674 | non viable | 703 | non viable | -81 |
| motorway + 1st + 2nd + 3rd class roads | | non viable | 773 | non viable | 808 | non viable | 110 |

These strategic options were assessed in Deliverable 1 and presented to the MRDPW and RIA for comments. This work showed that satellite distance based e-tolling for heavy vehicles and e-vignette for light vehicles are the best options and could provide a tariff range and road coverage for bridging the revenue gap. Following some additional consultations, this Deliverable 2 looks in detail at e-vignettes for light vehicles and distance-based e-tolling for heavy vehicles, as summarized in this document and supported by three parts as follows:

- **Part 1.** The institutional and operational models, legal changes and procurement work needed to deliver this new revenue, and support interoperability. This specifically looked at the option of a Special Purpose Entity set up for Government tolling roles
- **Part 2.** A Master Implementation Plan, defining the tasks and timelines, and
- **Part 3.** An updated and extended financial and traffic model

2. The Vision for Bulgaria

It is essential that tolling in Bulgaria supports national and EU policy context. Government wants a unified, fair and high standard for revenue collection, guided by the state, including control over financial flows and transparency of revenues. The proposed approach must:

- Allow “interoperability” in accordance with European law;
- Allow flexibility to meet future needs and unimpeded upgrade;
- Be user friendly to gain public acceptance; and
- Assist Bulgaria meet its security obligations and the fight against crime.

The approach must be flexible to future policy needs and growth in traffic, and support existing and new data needs such as for Customs. And beyond raising revenue, there are future policy opportunities to remove reliance on fuel duty as vehicles become more efficient, to implement smart management of roads and to charge by impact of emissions.

Tolling technology has become easier to use. In-vehicle equipment has become far cheaper, services are proven and give extra revenues for many EU Member States. New services are deploying every year and the evidence base and market size is increasing. Many countries such as Poland, Hungary, and Slovakia have successful heavy vehicle tolling that delivers high revenues. In addition to tolling, mainstream consumer and vehicle technology now offers connectivity to vehicles and people, new ways to pay for roads services and further ways to reduce costs, such as by using smartphones. In the future, connected vehicles will emerge and allow new services where tolling may be a backbone.

Not all plans to introduce or expand tolling have been successful. This is due, for example, to poor user acceptance, lack of integration and poor stakeholder consultation. So Government has the opportunity to capitalise on lessons others have learnt and understand where challenges lie.

The World Bank Recommended Model:

Introduction of e-tolling only for heavy vehicles by means of an on board unit registering data based on GNSS and e-vignette for light vehicles covering all national road classes (motorways + class 1, 2 and 3 roads). Achieving also interoperability within the scope of the EETS Directive.

The analysis showed that a Special Purpose Entity (SPE) is best suited to implement all Government roles. Since the procedure for the legal setting up of a SPE cannot start prior to the mandatory launching of procurement for timely provision of revenues, it implies that RIA

or some other existing state body shall manage the early stage of procurement and control of supply contracts.

3. Collecting the Revenue in Practice

The overall vision is shown below. This shows:

- Bulgarian heavy vehicles would be electronically tolled using either existing technology in their vehicles such as fleet management systems or smartphones, or via new on-board units. Occasional users without on-board units could simply buy a “route pass” either on-line or at designated sales outlets for travel on a particular route and specified time
- Foreign heavy vehicles would buy route passes, buy or rent an on-board unit or, in the future, use EETS services that allow interoperability across Europe.
- Bulgarian and foreign light vehicles will buy an e-vignette, similar to the current approach but linked to their number plate and stored electronically.

E-tolling payments can be made using bank /debit cards or bank accounts, or linked to other forms such as fuel cards. Users can use these methods on-line, by phone, or by post and e-vignettes can be bought using cash. RIA’s LIMA app offers possibilities for e-vignette purchase.

Key benefits of this approach for Bulgaria are:

- It has minimal risk of failure, by adopting solutions already proven elsewhere and tailoring them to Bulgaria, rather than an unproven innovative risky solution. It can be procured readily from many suppliers in the market with minimal risk.
- One contractor would supply the technology and base services but other companies then provide added services, for example fleet management for vehicles with tolling combined
- The capture of the key revenue from transit traffic can be by e-vignette, “route passes” or on-board units, and in the future by EETS interoperable units

Enforcement of the e-tolling system provides a good opportunity to also deploy an e-vignette for light vehicles using the same system that checks number plates against payments and issues penalties to non-compliant users.

E-tolling and e-vignettes are the first layer of many opportunities. They would also:














- Develop significant employment opportunities across Bulgaria
- Develop a centre of excellence in Bulgaria to exploit future technology developments and allow opportunities for Bulgarian companies to offer value added services, for example to help the Bulgarian freight fleet save money by adopting fleet management technology

The vision diagram below shows for each type of user:

- What they need to do to be compliant
- How and where they pay

- The combined enforcement approach for both light and heavy vehicles

The Vision for Bulgaria

| User | What they need to do | How and where they pay | How they are enforced |
|---|---|---|---|
|  | <ul style="list-style-type: none"> Use tech already in truck (OBU, smartphone, fleet management) Or buy a new OBU Or buy a route pass  | <ul style="list-style-type: none"> Account – pre pay or post pay (if good credit)  <p>Fleet management service</p> |   <p>Checks of number plates</p> <p>↓</p> <p>Penalty posted to vehicle owner</p> <p>↓</p> |
|  | <p>Buy an evignette giving number plate</p>  |  <p>Apps including LIMA</p> | <p>↓</p> <p>Penalty posted to vehicle owner</p> <p>↓</p> |
|  | <ul style="list-style-type: none"> Buy a route pass Buy or rent an OBU or   | <ul style="list-style-type: none"> Account single payment or EETS |  <p>→</p>  |

4. Institutional Model for Implementation Options

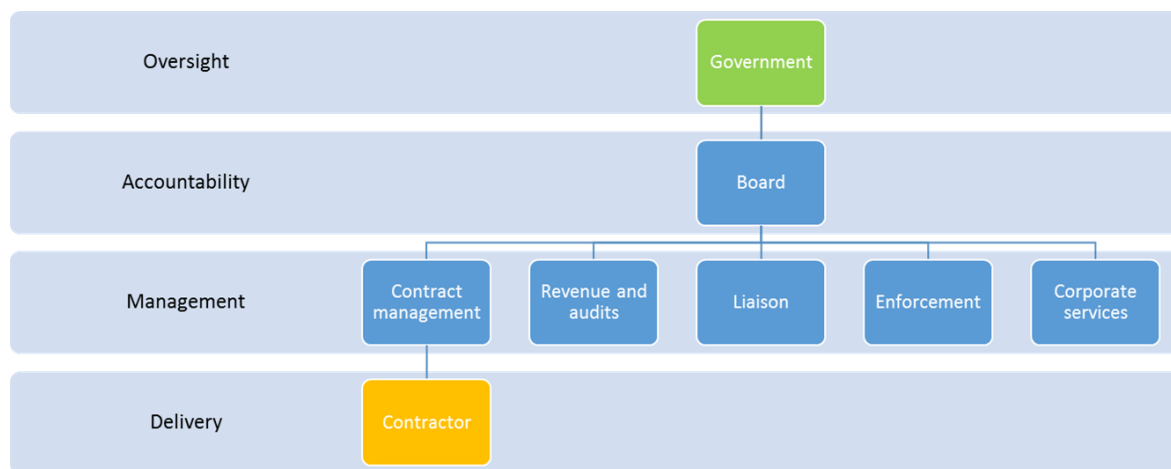
To deliver these Government activities, such as receiving tolls, enforcement and management of the Contractor, we have examined several options. Of these, a single Special Purpose Entity (SPE) can best fulfil all Government roles, including enforcement, apart from road management and setting toll rates. These would remain the responsibility of RIA and the Ministry of Regional Development and Public Works. The SPE option provides a “one stop shop” for tolling activity, brings enforcement and operations together seamlessly, and allows the ability to recruit new expertise from the market.

The option of an SPE would be similar to the Austrian state tolling organization (the ASFiNAG Maut Service Co) and NDS in Slovakia.

But this option could only apply once tolling is operational, as the process of establishing the SPE legally and then getting it set up cannot be achieved before procurement must start in order to deliver on time revenue. This means that RIA or some other existing Government body will have to manage the early procurement and contract supervision stage.

There would be short-term challenges in setting up such a company, so a rapid decision should be made by the Government with a commitment to timely amend legislation, such as the Roads Act. If an SPE is not chosen, then an appropriate enforcement body will still be needed.

Such a SPE could be structured as shown below:



5. Procurement of the Contractor

Services would be provided by a single Contractor, appointed by government under the Public Procurement Law. There would then be a variety of Service Providers from the market offering the ability for heavy vehicle users to pay tolls, either using equipment they provide or their own fleet management devices (increasingly these are becoming based on smartphones).

The Contractor would also provide services and on-board units for users unable to make a contract with a Service Provider, and Route Passes for occasional users. The Service would also be interoperable with the European Electronic Toll Service (EETS) as this develops.

6. Operations and Enforcement

The Contractor will also provide the technology and equipment for enforcement, and could operate this at the roadside. For ease of enforcement, tolling should not be based on axles, suspension, or weight of vehicle plus trailer but instead on the maximum permitted weight of the vehicle, emissions class and whether the vehicle is towing a trailer or not.

Enforcement gantries will be installed to capture a digital image of a vehicle. These where possible will be based on existing count sites, with added technology. Mobile enforcement units supplement gantries. Penalties for foreign vehicles are sent to the appropriate foreign enforcement body. This approach requires on-line access to the vehicle registration database else the enforcement body will have to stop vehicles at the roadside, adding cost and complexity.

7. Programme

The programme has been developed in a Master Implementation Plan shown overleaf for procurement and deployment, legal changes and ongoing support after deployment.

The milestones in the plan enable the following achievements:

- Award a contract for provision of the necessary systems and services - **March 2017**
- Commencement of e-toll collection for Heavy Vehicles - **February 2018**
- Commencement of e-vignette operations - **July 2018**. Note that this is split from e-tolling to spread customer operations, communications and testing loads
- Commencement of enforcement operations and contract monitoring by a Special Purpose Entity or other enforcement body as required - **February 2018**

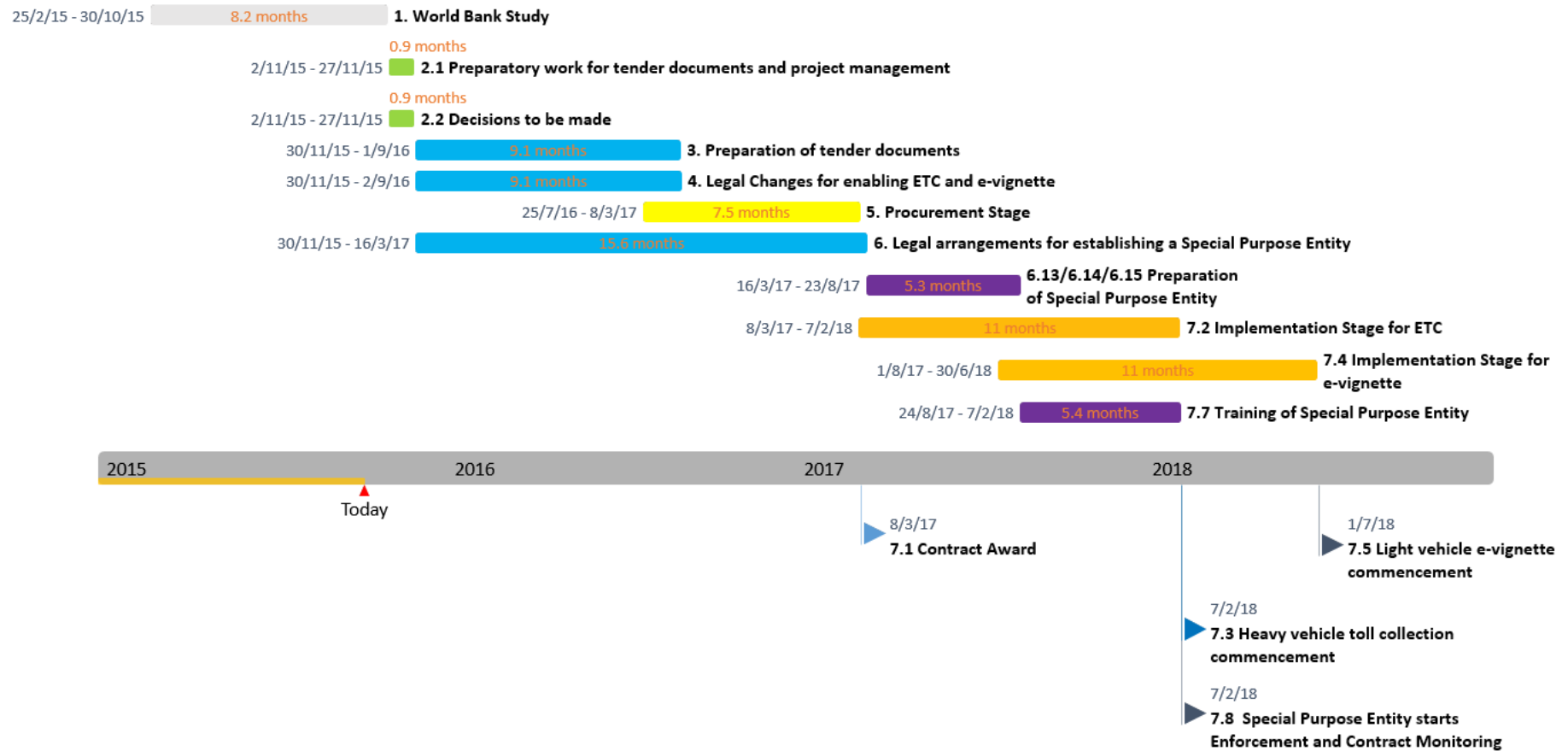
The main activities and products are:

- Preparation of tender documents including requirements - this needs to start in **December 2015**
- Legal changes to enable e-tolling and e-vignette and to establish the Special Purpose Entity (if required) - this needs to start in **December 2015** too
- Contractor implementation of systems
- Contractor delivery of operational services for the duration of the contract
- Handover of enforcement facilities to the Special Purpose Entity or other body

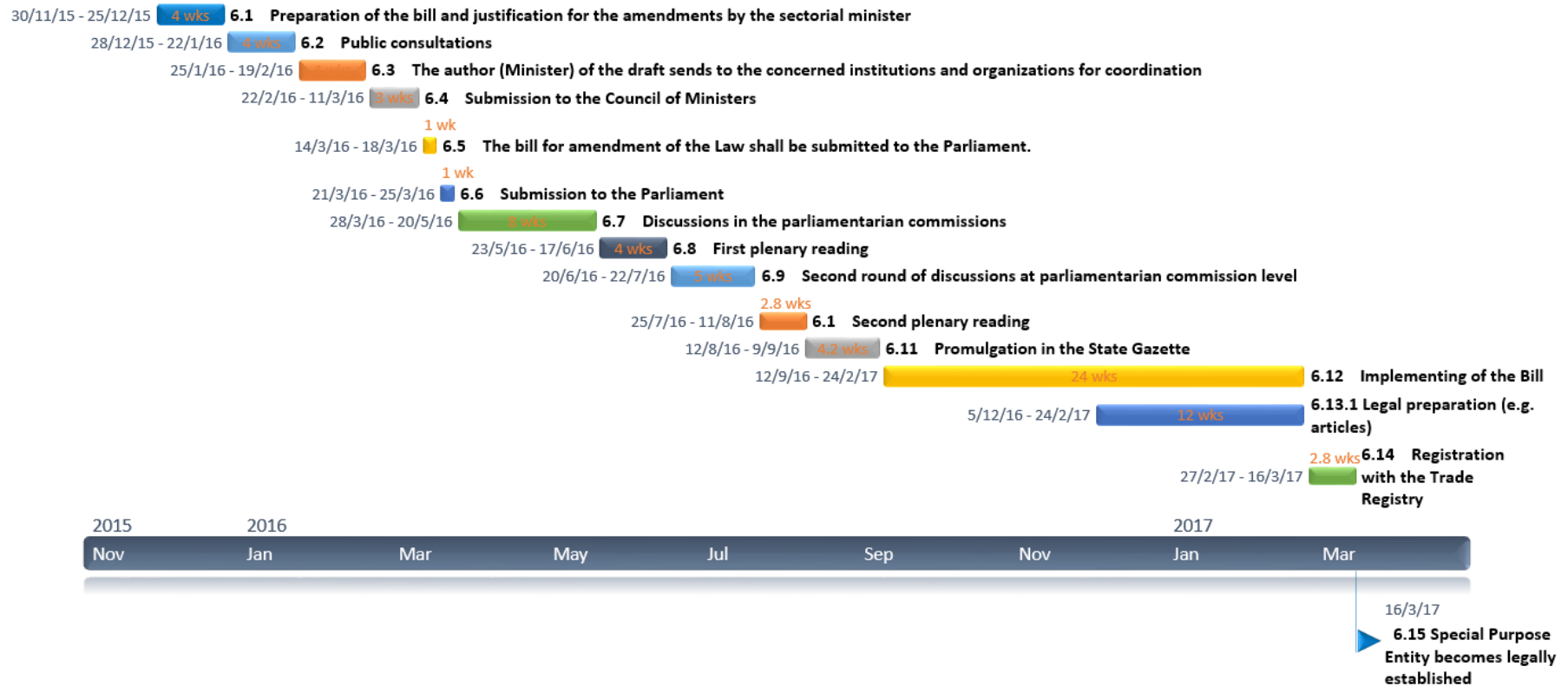
Note that these timescales are the same whether an SPE or other body is set up, as the critical path is procurement and testing. If another body takes over enforcement tasks instead of the SPE revenue would not accrue any more quickly.

Project Timelines

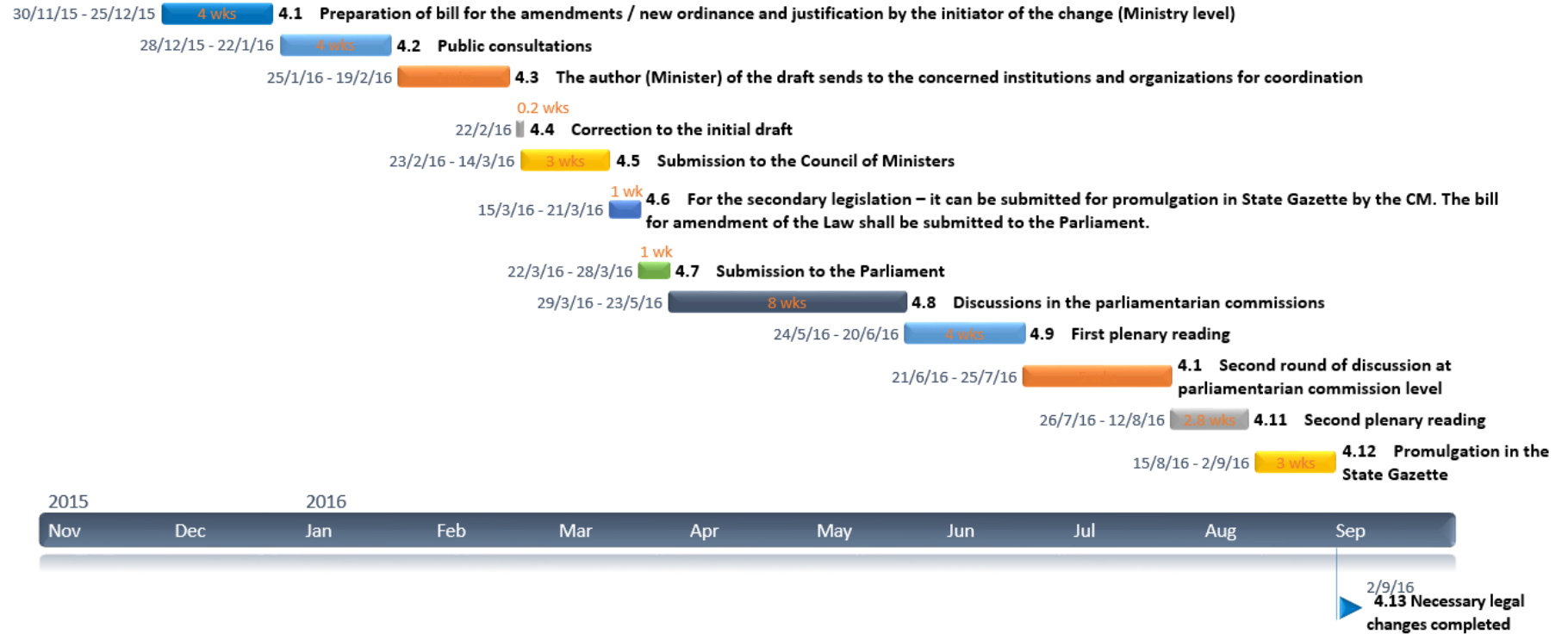
Main Tasks and Milestones – Overall Project Schedule



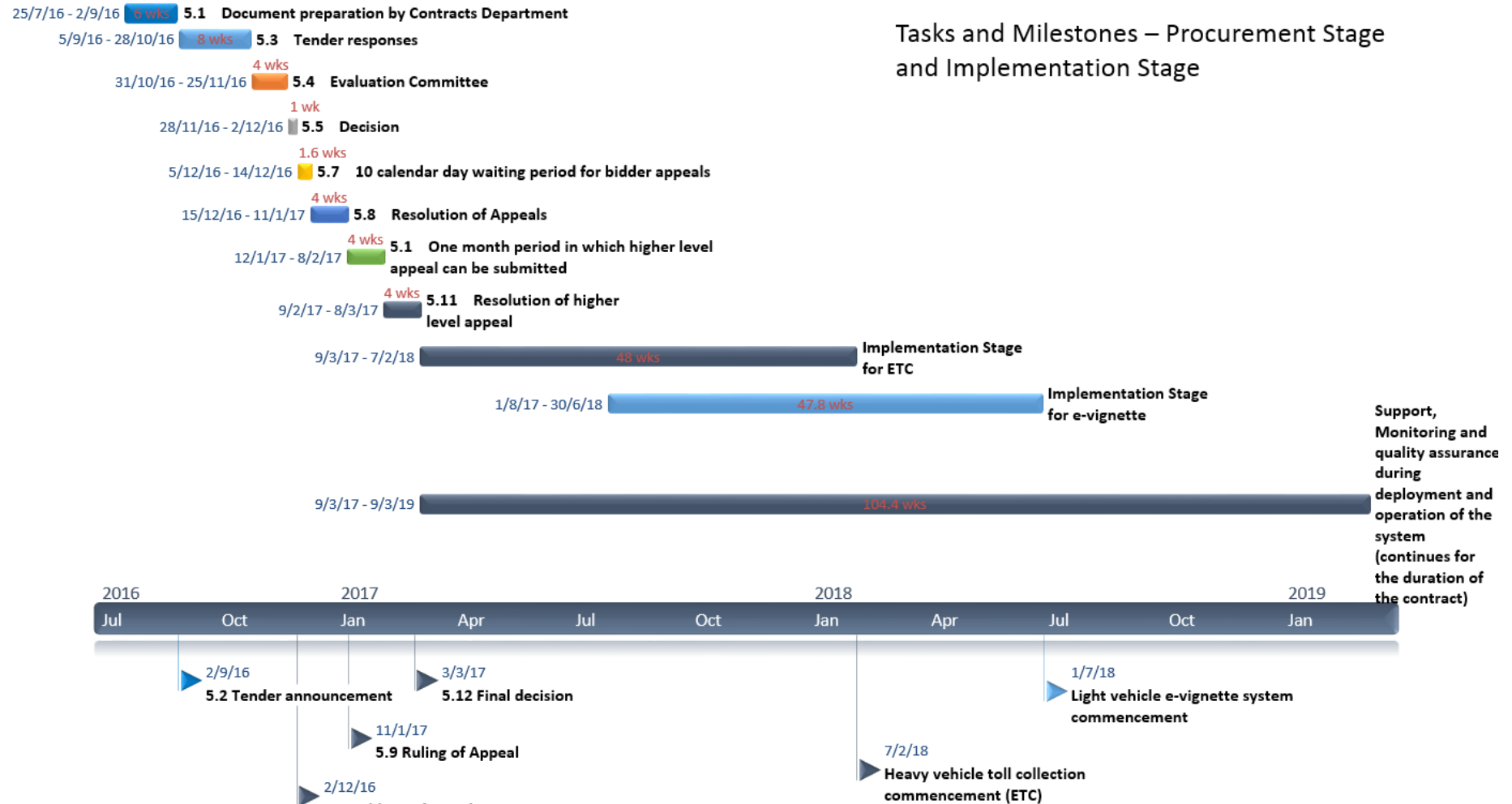
Tasks and Milestones – Legislation to establish a Special Purpose Entity



Tasks and Milestones – Change of legislation to enable ETC and e-vignette



Tasks and Milestones – Procurement Stage and Implementation Stage



8. Finance Summary

We have assessed in detail the combination of:

- **2 scenarios of e-vignette charges (150 BGN or 97 BGN per year, with current day and monthly vignette charges retained) ;with**
- **3 scenarios of e- tolling charges (60%, 100% and 130%) of recommended rates as shown below in BGN/ km.**

| | Bus | | Small Truck | | Medium Truck | | Heavy Truck | | Articulated Truck | |
|--|-------------|---------------|-------------|---------------|--------------|---------------|-------------|---------------|-------------------|---------------|
| | EURO I – II | EURO III – V+ | EURO I – II | EURO III – V+ | EURO I – II | EURO III – V+ | EURO I – II | EURO III – V+ | EURO I – II | EURO III – V+ |
| GOV recommended rates (av. BGN 0.2) | | | | | | | | | | |
| M | 0.22 | 0.17 | 0.18 | 0.14 | 0.22 | 0.17 | 0.26 | 0.20 | 0.33 | 0.26 |
| I | 0.22 | 0.17 | 0.18 | 0.14 | 0.22 | 0.17 | 0.26 | 0.20 | 0.33 | 0.26 |
| II | 0.18 | 0.14 | 0.15 | 0.11 | 0.18 | 0.14 | 0.26 | 0.20 | 0.33 | 0.26 |
| III | 0.14 | 0.11 | 0.11 | 0.08 | 0.14 | 0.11 | 0.34 | 0.26 | 0.39 | 0.30 |
| 60% of GOV recommended rates (av. BGN 0.12) | | | | | | | | | | |
| M | 0.13 | 0.10 | 0.11 | 0.08 | 0.13 | 0.10 | 0.16 | 0.12 | 0.20 | 0.15 |
| I | 0.13 | 0.10 | 0.11 | 0.08 | 0.13 | 0.10 | 0.16 | 0.12 | 0.20 | 0.15 |
| II | 0.11 | 0.08 | 0.09 | 0.07 | 0.11 | 0.08 | 0.16 | 0.12 | 0.20 | 0.15 |
| III | 0.08 | 0.06 | 0.06 | 0.05 | 0.08 | 0.06 | 0.21 | 0.16 | 0.24 | 0.18 |
| 130% of GOV recommended rates (av. BGN 0.26) | | | | | | | | | | |
| M | 0.28 | 0.22 | 0.23 | 0.18 | 0.28 | 0.22 | 0.34 | 0.26 | 0.43 | 0.33 |
| I | 0.28 | 0.22 | 0.23 | 0.18 | 0.28 | 0.22 | 0.34 | 0.26 | 0.43 | 0.33 |
| II | 0.23 | 0.18 | 0.19 | 0.15 | 0.23 | 0.18 | 0.34 | 0.26 | 0.43 | 0.33 |
| III | 0.18 | 0.14 | 0.14 | 0.11 | 0.18 | 0.14 | 0.45 | 0.34 | 0.51 | 0.39 |

These rates compare to other countries as shown below (red means higher than Bulgaria) for rates in April 2015:

| | GOV recommended rates (av. BGN 0.2) | | | 60% of GOV recommended rates (av. BGN 0.12) | | | 130% of GOV recommended rates (av. BGN 0.26) | | |
|-----------------|-------------------------------------|-------------|-------------|---|-------------|-------------|--|-------------|-------------|
| | Medium and Heavy Truck Types | | | Medium and Heavy Truck Types | | | Medium and Heavy Truck Types | | |
| | Medium | Heavy | Articulated | Medium | Heavy | Articulated | Medium | Heavy | Articulated |
| Austria | 0.38 | 0.53 | 0.79 | 0.38 | 0.53 | 0.79 | 0.38 | 0.53 | 0.79 |
| Hungary | 0.29 | 0.41 | 0.60 | 0.29 | 0.41 | 0.60 | 0.29 | 0.41 | 0.60 |
| Slovakia | 0.34 | 0.36 | 0.38 | 0.34 | 0.36 | 0.38 | 0.34 | 0.36 | 0.38 |
| Germany | 0.29 | 0.29 | 0.30 | 0.29 | 0.29 | 0.30 | 0.29 | 0.29 | 0.30 |
| Czech Republic | 0.14 | 0.22 | 0.32 | 0.14 | 0.22 | 0.32 | 0.14 | 0.22 | 0.32 |
| Poland | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 |
| Bulgaria | 0.16 | 0.25 | 0.31 | 0.10 | 0.15 | 0.18 | 0.21 | 0.33 | 0.40 |

| | evignette rate option 1 | | | evignette rate option 2 | | |
|-----------------|-------------------------|-----------|------------|-------------------------|-----------|-----------|
| | Weekly | Monthly | Annual | Weekly | Monthly | Annual |
| Hungary | | 32 | 286 | | 32 | 286 |
| Slovenia | 30 | 60 | 230 | 30 | 60 | 230 |
| Austria | | | 165 | | | 165 |
| Slovakia | 20 | 28 | 100 | 20 | 28 | 100 |
| Romania | 6 | 14 | 56 | 6 | 14 | 56 |
| Bulgaria | 10 | 25 | 150 | 10 | 25 | 97 |

This shows that the **recommended rates are lower than most other countries except Poland for heavy vehicles and Romania for light vehicles.**

Different emissions classes for trucks have different rates. By maintaining this differential pricing between emission classes, the trend to “**cleaner**” trucks will continue. Larger trucks of more than 12 tonnes will almost completely converge to cleaner emission classes (EURO III - V+) within the next couple of years. At this point, a new emissions rate may be needed to maintain the trend.

These scenarios have been tested for road networks from motorways plus class 1 roads, then adding class2 and then class3 roads. This gives 18 different cost and benefit scenarios. The impact of reduced toll road traffic due to different toll rates has been also assessed.

The capital costs to collect these charges would range from 479M BGN to 745M BGN depending on road coverage, with operational costs of 148M BGN to 253 M BGN per year after that. But depending on the chosen scenario, revenues per year could range from 661M BGN to 1,483 M BGN from 2018. So in all but a few cases, the system would break even in the first year.

However, the target for revenue still must be met, so looking at the average net revenue per annum over ten years and allowing for the cost of finance by using an NPV approach shows the following options and sensitivities:(Shown in **green** if net revenue is greater than 400M BGN per annum or **red** if less)

| | E-toll for Trucks 60% of Recommended Rates | Recommended Rates | E-toll for Trucks 130% of Recommended Rates |
|--|---|--------------------------|--|
| Option 1 for e- vignette (150 BGN per annum) for passenger cars | | | |
| Motorway plus 1st class roads | 343 | 512 | 639 |
| Adding second class roads | 412 | 663 | 851 |
| Adding third class roads | 465 | 776 | 1001 |
| Option 2 for e-vignette (97 BGN per annum) for passenger cars | | | |
| Motorway plus 1st class roads | 266 | 435 | 562 |
| Adding second class roads | 336 | 586 | 774 |
| Adding third class roads | 389 | 700 | 932 |

This shows the trade-off between light and heavy charges, and road coverage. The key is that the target cannot be met unless:

- A low e-vignette price is combined with recommended heavy vehicle rates, although not all the network needs to be charged for heavy vehicles; or
- A high e-vignette price with lower heavy vehicle charges, but with additional roads charged for heavy vehicles.

Looking at average NPV over the ten years suggests the low cost e-vignette plus low cost e-tolling option will not meet this target. Hence either e-tolling or e-vignette charges need to be around the recommended level but this means there is room for manoeuvre of rates if required. Adding class 2 and 3 roads gives additional net revenue, as does increasing rates,

but does increase risks to delivery because of the geographic scope and poor public acceptance.

9. Legal Changes Needed

There is a need to address areas chosen to give the minimum amount of legal changes required:

- Amendments to permit e-tolling and e-vignettes for Bulgaria
- Creating a Special Purpose Entity (SPE), should this approach be selected

The Roads Act and Road Traffic Act and various ordinances, specifically Ordinance No-160, will need amendment. To fulfil Member State obligations under the EETS Directive and Decision, not only must EETS Providers be accepted, but also Government must set up a Register of EETS Providers in Bulgaria and create a Register of Toll Domains in Bulgaria.

10. Summary of Recommendations

The recommendations in this report are:

- **Government decision on the model recommended by the World Bank.** Introduction of e-tolling only for heavy vehicles by means of an on board unit registering data based on GNSS and e-vignette for light vehicles covering all national road classes (motorways + class 1, 2 and 3 roads). Achieving also interoperability within the scope of the EETS Directive. RIA or another existing state body shall manage the early stage of procurement and control of supply contracts.
- One contractor should supply the technology and base services but other companies then provide added services, for example fleet management and tolling combined.
- The capture of the key revenue from transit traffic can be by “route passes” or on-board units, and in the future by EETS interoperable units.
- Enforcement of the e-tolling system provides an opportunity to also deploy an e-vignette for light vehicles, using the same system that checks number plates against payments and issues penalties to non-compliant users.
- The **SPE option provides a “one stop shop” for tolling**, brings enforcement and operations together seamlessly, and allows the ability to recruit new expertise from the market. But this option could only apply once tolling is operational, as establishing the SPE cannot be achieved before procurement must start to deliver on time revenue.
- There would be short-term challenges in setting up an SPE, so a rapid decision should be made. If an SPE is not chosen, then an appropriate enforcement body will still be needed.
- Services would be provided by a contractor, appointed by Government under the Public Procurement Law. The contractor will also provide the technology and equipment for enforcement, and could operate this at the roadside.

- Tolling should not be based on axles, suspension or weight of vehicle plus trailer but instead on the maximum permitted weight of the vehicle, emissions class and whether the vehicle is towing a trailer or not.
 - Enforcement gantries will be where possible based on existing count sites, with added technology. Mobile enforcement units supplement gantries.
 - This approach requires on-line access to the vehicle registration database else the enforcement body will have to stop vehicles at the roadside, adding cost and complexity
- Penalties for foreign vehicles will be sent to the appropriate foreign enforcement body
- There is a need to amend legislation to permit e-tolling and e-vignettes and to support creating an SPE, should this approach be selected. The Roads Act and Road Traffic Act and various ordinances, specifically Ordinance No-160, will need amendment.
 - A variety of combinations of e-vignette and e-tolling rates can meet the revenue gap and allow choices in network coverage and initial rates, while still be under the EU average.

11. The next steps

Specific actions now quickly needed to be addressed to ensure on time revenue are:

- Develop a communications plan with key stakeholders for the project, especially road users and hauliers, so that they can prepare for the changes. This will soon be critical as we move to procurement and is an area where other countries have failed to deploy in time to prevent public unrest.
- Rapidly choose the body that will undertake enforcement (SPE or other). This needs to be done quickly to avoid delaying the next stages of design. If a new body is set up it can lead on all aspects of tolling operations from enforcement to overseeing Contractor operations.
- Start quickly to consider the changes to legislation identified in this report to support various details of e-tolling and its procurement, and transposition into Bulgarian Law of the EETS Directive.
- Look at the vehicle ownership and registration database and possibilities for access to improve joined up data use and reduce costs for better data sharing in Government. A decision on access to the registration database has a direct impact on who operates enforcement - a uniformed public body or a private body - and on foreign vehicle enforcement.
- Rapidly prepare contract documents based on the institutional and operating model and decide who will undertake the procurement.
- Engage with Bulgarian industry, especially fleet management providers and local companies able to be Service Providers, and engage with the international tolling industry, to prepare them for the tender.

Chapter 1: Institutional Model, Technology, Legal and Procurement Issues and Interoperability

Summary

This Deliverable 2 provides a detailed review for implementation of e-vignettes for light vehicles and distance based e-tolling for heavy vehicles in Bulgaria. It comprises three parts:

- Part 1 (this document) looks into institutional and operational models, legal amendments, procurement issues and European interoperability.
- Part 2 - Implementation Master plan discussing project management and time schedule
- Part 3 - updated financial model

In addition, this notice has been prepared in summary of the above stated.

First of all this document looks into the institutional model of the e-tolling system. It is based on the model described in the European decision of 2009/750/EC (EETS decision) which determines the specific responsibilities that may be implemented only by the Government.

Several options for implementation of these Government responsibilities have been discussed, as for example receipt of distance based toll charges, monitoring the Contractor's quality assurance and management. Setting up of a single Special purpose entity (SPE) has been proposed as the most suitable option for taking over the Government functions, including enforcement, but excluding road management and setting the size of road charges, which are to remain within the authority of RIA and the Ministry of Regional Development and Public Works. That option provides a 'one stop shop' for e-tolling services, merges enforcement and operational activities, and is conducive to acquisition of new know-how from the private sector. This model can only be applied after the distance-based e-tolling system is already in place, since the establishment of SPEs from a legal perspective shall not precede procurement and due revenue collection from e-tolling. That means that RIA or another state body, shall continue to manage and monitor the relevant procurement processes and the contracts signed as a result.

E-tolling collection services shall be provided by a Contractor assigned by the state following the provisions of the PPA, since that is the most appropriate means of contracting among the options discussed in this document. Moreover, it allows a number of private Service providers to provide distance-based e-tolling payment opportunities to heavy vehicle users or equipment using either equipment supplied by the Service Providers, or their own units for car-fleet management (increasingly these applications as smartphone based). The Contractor will also provide services for collection of e-tolling charges and on board units to consumers that have not signed a contract with a Service Provider, and rout passes for occasional consumers without an on board unit. In the process of its development this service will be operable with the European Electronic Toll Service (EETS).

Light vehicle users will be able to purchase e-vignettes from the Contractor, via a web site, call center and smartphone applications (including eventually the traffic application LIMA) by using multiple components for e-tolling collection and vehicles registration of the system applied for heavy vehicles. Additional canals for sale of rout passes and e-vignettes will be available to Customs and border crossing points.

The Contractor shall also provide the technology for performance monitoring and shall operate it on the road. In view of facilitating performance control, the amount of tolling shall not be calculated on the basis of number of axles, suspension type or combined weight of

vehicle and trailer, but on the basis of the maximum admitted weight, vehicle emission class and whether the vehicle is pulled by a trailer or not.

Gantries to support implementation control shall be installed on toll roads, where possible and at currently existing objects recording digital images of passing vehicles. In case of no violation, the image shall be deleted, but if a violation has occurred, the ticket shall be sent to the vehicle owner. Fines for violations by vehicles registered abroad shall be sent to the relevant enforcement body abroad. The operation of automated enforcement gantries installed on the roadside is also supported by Mobile Enforcement Units. That approach requires online access to the database of registered vehicles in the country and abroad to secure enforcement of sanctions, or at least off line access to check the registration of vehicles and owners upon opening an account for service provision. If such access is not available the enforcement body shall stop vehicles on the road, but this will complicate its work and will result in additional costs.

To permit distance based e-tolling and e-vignettes there is a need to amend legislation in the following fields:

- Amendments allowing for regulation of distance based e-tolling and e-vignettes in Bulgaria;
- Establishing of a Special Purpose Entity (SPE), should that approach be selected.

Amendments are needed to the Roads Act and the Road Traffic Act, including a number of bye-laws, such as Ordinance No 160 of July 7, 2008.

To meet its obligation as a member state under EETS Directive and Decision, the state shall not only permit activities of EETS providers, but shall also:

- Create a register of EETS Providers in Bulgaria and establish relevant conciliation bodies;
- Create a register of Toll Domains in Bulgaria (initially there will be only one Toll Domain)

The following specific actions shall be considered:

- Determine the enforcement body (SPE or other). That shall be done as soon as possible to avoid delays in the next phases of design. Should a new body be established, it may manage any aspect of e-tolling operations, from enforcement to monitoring Contractor's performance.
- Consider the legislative amendments listed in this report to support the functioning of the various e-tolling system elements and public procurement, including transposition of EETS Directive in the Bulgarian legislation.
- Consider to expand the possibilities for access to the registered vehicles ownership database to improve joined up data use and reduce costs for better data sharing in Government. A decision on access to the vehicle registration database will have a direct impact on who operates enforcement - a state body or a private body, and on the body for enforcement abroad.

- Prepare contract documents based on the institutional and operational model, and determine the body responsible for procurement.
- Develop a communications plan with key stakeholders for the project, especially road users and hauliers, so that they can prepare for the forthcoming changes.
- Engage in dialogue with the Bulgarian industry, especially fleet management system providers and local companies able to be Service Providers, including cooperation with the international tolling industry, to prepare them for the respective tenders.

1. Introduction

A Background

This is the first part of the third deliverable (Deliverable 2, following Deliverables 0 and 1) in the “Development of a Comprehensive Vision for the Introduction of the Electronic System for Provision of the European Electronic Toll Services in Bulgaria”. Bulgaria has critical road maintenance and upgrade needs that require substantial investment. This investment will help achieve economic growth and improve traffic management, road safety, national connectivity, trade facilitation, and security. The current revenue from sources such as vignettes and central funding does not cover the growing whole life costs of the Republican road network. So a long term sustainable solution is required to collect revenue through smarter approaches to tolling than the current sticker vignette system can allow.

Future tolling needs to be a smart policy “tool” to more fairly distribute costs amongst road users, rather than “one price for all” as now. Technology offers new options to achieve this aim, to collect revenue at different rates from different types of vehicles and on different roads, and to adopt the user/ polluter pays principle so that those vehicles that damage the roads most pay more. Such a policy approach would allow queue-free, integrated, and unified collection of tolls for the State.

Although optimal collection of net revenue is vital, other needs also apply. A key need is to be interoperable with the rest of the EU in line with Directive 2004/52/EC on the interoperability of road tolling. Any future approach also needs to be flexible to future policy needs and growth in users and uses, and support new services and existing government data needs such as Customs. Above all, the approach must be easy to use and achieve high levels of user compliance.

Bulgaria is one of the crossroads of Europe - with many Trans European corridors passing through it. This means a need to collect revenues from visiting and transiting vehicles, to maintain road quality and to support smooth border and internal security operations. The current vignette system collects revenue from foreign vehicles and there are opportunities here for smarter approaches to ensure visiting vehicles pay their fair share. The current sticker vignette system is costly to administer and may not collect all the revenues due - as it is not an easily enforceable system. It is also a very blunt tool - charging by duration of access rather than distance. New approaches to smarter, more effective collection than the vignette could improve revenue in a fair way. Beyond raising revenue, there is a potential future policy opportunity to remove reliance on fuel duty which will inevitably reduce as vehicles become more efficient, to implement smart management of road use by charging different rates at different times to reduce congestion and to charge by impact on road maintenance and emissions.

Tolling technology has become easier to use, in-vehicle equipment become far cheaper and services proven in use and successfully generated extra revenues for many countries, especially for trucks. New systems and services are deploying every year and the evidence base and market size is increasing. Many Eastern European countries now have heavy vehicle tolling in place and some are looking at all-vehicle solutions in the future. As well as tolling, mainstream consumer and vehicle technology now coming on stream offers increased connectivity to vehicles and people, new ways to pay for services and further ways to reduce costs.

Not all plans to introduce or expand tolling have been successful in other countries, due to, for example, poor user acceptance, lack of integration and poor stakeholder consultation. Bulgaria has the opportunity to capitalise on lessons others have learnt on what makes a successful deployment and where the challenges lie. So the overall need for a project is clear and the time is right to consider Bulgaria's specific needs and current investment.

B Objectives of the Project

Overall Objectives

The objectives of the project in this Stage I Module 2 are to develop a strategy and business model based on deliverable 1.

Stage II will then in the future support selection of a supplier by preparing contract documents.

C The Scope of this Deliverable

Structure

This document is one of three parts of deliverable 2:

- This document, dealing with institutional, technology, legal and procurement aspects as well as interoperability, is part 1
- A Master Implementation Plan in part 2 , which will need to be updated regularly
- A separate report on traffic and revenues in part 3

There is also an Executive Note covering all the areas for a non-technical reader.

This report contains the next level of detail down from deliverable 1 but is not yet a full specification for the procurement.

D The Structure of this Part 1

Structure

This deliverable follows the Terms of Reference and has chapters structured as follows:

- Chapter 2 looks at the institutional model of who undertakes which activity
- Chapter 3 looks at technology and interfaces to support how activities are delivered
- Chapter 4 looks at legal and procurement issues
- Chapter 5 looks at interoperability
- Chapter 6 contains the next steps

Appendices give supporting detail including the analysis of feasible options as presented in Deliverable 1.

E Meeting Requirements

Mapping to the ToR

The following table shows for each Term of Reference requirement which section in this deliverable contains the required information.

| Term of Reference Section | Contents | Covered in which Part |
|---------------------------|---|-------------------------------------|
| 2.1 | Identification of national routes or road sections for which it will apply. | Traffic and revenue report (Part 3) |
| 2.2 | Development of a draft master plan for the development of an Electronic System for the provision of EETS. | Master Implementation Plan (Part 2) |
| 2.3 | Monitoring and control of the development and implementation, and possible adjustments to the master plan. | Master Implementation Plan (Part 2) |
| 2.4 | Defining an institutional model / model for collaboration between public and private partners | Chapter 2 of this report |
| 2.5 | Developing a model for collaboration in the operation of the electronic system for provision of EETS (tasks, responsibilities, workflows, interfaces, etc.). | Chapter 3 of this report |
| 2.6 | Development of a legal model for the development and implementation of the system, including legal and organizational structure, contractual relationship with the system provider and the relationship of the provider with concerned agencies and institutions. | Chapter 4 of this report |
| 2.7 | Development of a preliminary financial model (flows of investment / costs / revenues, distribution of assets and liabilities, rules and frameworks for payment, etc.) | Traffic and revenue report (Part 3) |
| 2.8 | An estimate of revenues from the toll collection by classes of network and categories of vehicles for a period of 5-10 years | Traffic and revenue report (Part 3) |
| 2.9 | Development of preliminary financial plan for a forecasted / anticipated period of return on investment in terms of developing the electronic system for the provision of EETS | Traffic and revenue report (Part 3) |
| 2.10 | Development of a plan to ensure interoperability with other Member States having a system of electronic toll collection, within three years for vehicles over 3.5 tons and five years for all other vehicles after the decision on the introduction of EETS in accordance with Directive 2004/52 / EC on interoperability of electronic road toll systems in the Community. | Chapter 5 of this report |

2 The Institutional Model

A Overview

Objective

This section addresses the terms of reference requirement

Defining an institutional model / model for collaboration between public and private partners.

The model proposed for Bulgaria is based around the Service Provider (SP) and Toll Charger (TC) model described in Deliverable 1. This model allows roles to map to European Directives and also align with solutions in the market already. In summary, in this model for heavy vehicles:

- The “Toll Charger”, typically Government or a group of government bodies:
 - Operates the toll road
 - Charges for the use of the toll road
 - Sets the toll rates
 - Performs enforcement activities, including issuing penalties
 - Communicates with users about toll roads, rates and enforcement
 - Deals with enquiries from users related to any penalties issued
 - Undertakes legal responsibilities to support interoperable services under the European Electronic Toll System (EETS) Directive.
- The Service Provider (or Service Providers)
 - Ensures users have appropriate on-board equipment so tolls are correctly charged
 - Bills users for tolls , collects money from users and passes it to the Toll Charger
 - Deals with queries about on-board equipment and about bills for tolls
 - Receives payment from Government for carrying out this service
 - May also charge the user for provision of the service and for additional services
- The User
 - Interacts only with the Service Provider in normal operations
 - Installs or has already installed on-board equipment to locate the vehicle
 - Receives from the Service Provider bills for tolls and settles those bills
 - Pays to the Toll Charger any penalties received for non-compliance

Note that Route Passes are available for those who do not have an on-board unit. There will then be a “Contractor” to provide the technology and services that underpin the government roles.

In Bulgaria, a single body separate from RIA and from the Ministry of Regional Development and Public Works could fulfil all the Government functions of the Toll Charger except:

- The operation of roads. It is assumed that RIA will retain responsibility for the construction, maintenance, and operation of roads.
- The setting of toll rates, including the definition of toll liable vehicle classes, the definition of road classes and individual roads liable to toll, the toll rates for those vehicles and roads as well as discounts and exemptions. It is assumed that these will remain the responsibility of the Ministry of Regional Development and Public Works.

Such a single body could also go further than just the above roles, by acting as a single “one stop shop” for tolling that users would recognise, and be the hub for communications with users and stakeholders including media during operations. It would link the day to day management of the project and the Contractor with enforcement of non-compliance, an area where close liaison is essential, and it could also provide the core for interoperability tasks needed to support EETS.

B Potential for a “Special Purpose Entity” In Bulgaria for Tolling

Options for the Government role of Toll Charger

The role of Toll Charger shown above requires a definable organization which is responsible for toll revenue and particularly enforcement. There are several typical ways in which this organization can be delivered, including as:

- A single department within an existing governmental organization
- Separate departments (e.g. tolling and enforcement) within governmental organizations
- A single entity at arm’s length from existing governmental organizations, having a remit of focusing on tolling and enforcement - a so-called “Special Purpose Entity (SPE)”. This could undertake all of the Toll Charger functions identified above except roads operation and charge setting, and be a focus for communications with users. Hence it would be a “one stop shop” for the Government side of tolling.

A key Government function is that of enforcement and, as shown in the Master Implementation Plan, having a suitable enforcement body in place and training its team drives the availability of revenue.

It is assumed that the Toll Charger role, including enforcement, will be carried out by a state owned and operated entity (or entities) we shall from this point on simply call “Government”. Government will be responsible for procuring the necessary contracts to design, build, install, maintain, and operate the system and enforcing it, as well as stakeholder communications. The key question is the form that the “Government” body could take from the above options?

Hence this section briefly describes firstly how this role is delivered in other European countries; it then describes the strengths, weaknesses, opportunities and threats (SWOT analysis) of an SPE and addresses the issues to be resolved in setting up an SPE.

Other European Practices

In Europe, the role of Toll Charger is either carried out by a private motorway company or by a government agency or private operator appointed by government. One model is a state-owned company used in several EU member states for heavy vehicle electronic tolling. An organization such as this can have greater budgetary ‘ownership’ and ability to plan expenditure over long term and with less risk to programs due to political cycles.

For example in Austria, ASFiNAG Maut GmbH is a 100% government owned company which has responsibility for the operation of the e tolling, and vignette systems. The company responsible for construction, operation, and maintenance of motorways and national roads is fully funded from toll and vignette revenues collected by ASFiNAG.

Similarly in Slovakia, NDS (National Motorway Company), a joint stock company 100% owned by the state, is responsible for operation and maintenance of motorways and national roads and collects income from a vignette for light vehicles and e-tolling for heavy vehicles

In Hungary, the government established a company (National Toll Payment Service PLC) with specific and separate responsibility only for the operation of ETC and Vignette systems.

In Poland, the Czech Republic, and Germany, government appointed an operating contractor directly rather than through a special purpose company, although in Germany the government is a partner in the operator. In Poland, enforcement is by a separate government organization.

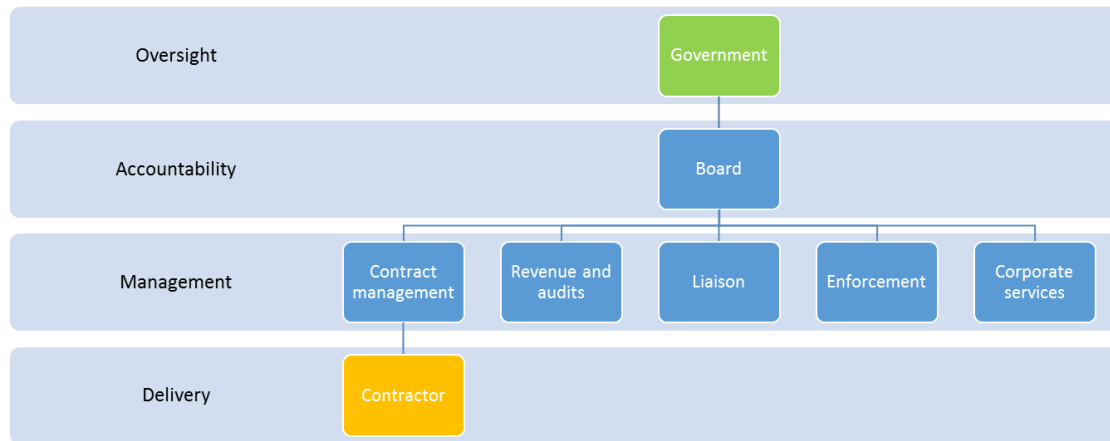
In Spain, Italy, and France Toll Chargers are private companies.

SPE Options for Bulgaria

An SPE would be responsible for all aspects of tolling as a separate entity, but under the oversight and ultimate control of the Government. It would have executive powers and day-to-day delivery responsibility against strategic outcomes (eg net toll revenue).

It would be similar in many ways to the existing body (National Company Strategic Infrastructure Projects) set up to deliver motorways in Bulgaria. Such a company would be structured as shown in Figure 1:

Figure 1. Proposed SPE Organization Structure



In this proposed model:

- Government would be the only shareholder, and have oversight over all outcomes (as any company is responsible to its shareholders)
- A Company Board would be accountable for the funds allocated by Government used to initially collect toll revenues (and ultimately use some of those revenues to fund itself), passing the majority back to Government. This Bboard would be similar to any company , with a chair, a CEO and a CFO
- The SPE would provide or delegate the following activities:
 - Management of the Contractor and supply chain plus other Service Providers, who will provide many of the services and infrastructure
 - A revenue/ audit department, checking that the revenue collected by the Contractor is correct and reporting upwards on the tolls collected to the Board and Government
 - A liaison team, to work with RIA, customs, the police and other agencies and allocate responsibilities and resources where need be for example for data sharing, roadside operations, vehicles of special interest
 - Enforcement, managing day to day enforcement operations , issuing penalties and downstream activity such as appeals
 - Corporate services, for example taking the role of Toll Charger as defined in the EETS legislation to define and set charges, approve contracts and other activities only a semi Government organisation can undertake

The Contractor would provide activities such as customer services, toll collection, account management, equipment installation and maintenance, OBU supplies, etc., as detailed in later sections.

The Board would have high level Key Performance Indicator (KPI) targets to meet, notably on revenue collection accuracy and service quality. They will pass these down to their teams

and to the contractor to deliver against with penalties if they are missed. Like any company, non-delivery of the targets could mean loss of position for Board members.

The advantages of this SPE would be:

- It would be a single center of expertise in a new discipline, (e-tolling) with single points of contact for the contractor and Government, rather than a patchwork of organisations responsible for various aspects (e.g. enforcement, revenue, interoperability)
- It would focus on the delivery of revenue as tolling would be its core business and so resources would be “ring fenced”, and not spread across many functions
- The mix of private sector ethos and talent, yet working for Government as the ultimate controlling body, means incentives can be made for on time delivery and market salaries can be paid for specialist skills. Equally, non-performance is easier to punish.
- It could identify and allocate resources from the toll revenue stream, so avoiding issues of bodies being given responsibilities without additional resources from Government. It can choose how best to pay to undertake various operations not able to be done by the Contractor
- Having a single company able to procure and manage services from the market will give confidence to the market that Bulgaria is a new key player in tolling, and also shows commitment to the EC to interoperability. The Toll Charger role is vital to opening up interoperable systems
- Still having accountability to government for delivery of revenue, but leaving the day to day decision making to those best placed to make decisions
- The ability to plan and programme budgets independently from Government funding and decision making cycles - so not having to worry about stop/ start funding
- A single “brand” for tolling, so that customers know who operates the service and who is responsible, with a single champion for tolling in Bulgaria - the CEO
- The opportunity to attract new talent in a new structure, especially in areas not part of Government core business, such as tolling, enforcement and customer services
- The ability to mix and match the wide variety of skills and experience from existing bodies and new talent needed to deliver a complex multi- disciplinary service like tolling
- Acting as a focus for new services and innovation such as connected vehicles
- Being an umbrella for data sharing in the roads sector
- Above all, being positioned at arm’s length from government, being seen to collect tolls for reinvestment in roads rather than “just another government tax collector”

Potential disadvantages of setting up a new SPE are:

- It would take time to set up the organisation and find suitable talent, so a decision to proceed should be made quickly. Even then it is unlikely as shown in the Master Implementation Plan that the SPE can be in place in time to let the procurement. The SPE would therefore be an operational body, not a procurement one.
- There is a large volume of supporting experience in many current organisations such as RIA and Customs, so careful access to resources is needed to ensure this is not lost.
- Memoranda of Understanding with supporting partners, e.g. Police and Customs, will be needed to define a clear interface with the new body and responsibilities.
- Setting up the organization will require more funds before toll revenues flow than a conventional body, but would reduce costs longer term.

The table below summarizes the strengths, weaknesses, opportunities, and threats from the use of an SPE (government owned) as the “Government” side for tolling operations.

Table 1. SWOT Analysis Summary

| | |
|---|---|
| <p>Strengths</p> <ul style="list-style-type: none"> • One single body is accountable for tolling in Bulgaria with an individual champion, instead of a patchwork of organizations • A focus on delivery of revenue • Able to incentivize delivery • Manages its own resources from the toll revenue stream • Gives confidence to the market and shows commitment to EETS • ‘Arm’s length’ body may be less dependent on political cycles / timescales • Ability to recruit expert and specialist tolling staff at private rather than public pay rates • Possible greater budgetary ‘ownership’ to plan expenditure over long term • Integration of toll collection and enforcement functions • Resources would be dedicated to functions associated with delivering toll revenue collection and enforcement • Possibility to create a recognizable brand identifiable to users and other stakeholders as one place being responsible for toll operations • Public procurement rules still apply for transparency • Fewer operational interfaces day to day between bodies • User perception is that tolls are more linked to roads costs than a general tax from Government | <p>Weaknesses</p> <ul style="list-style-type: none"> • Time will be needed to set up the body, recruit staff and train them (although to some extent this will apply to any government organization). • Lack of knowledge of road network / traffic operations unless good links with RIA are established • Knowledge and expertise residing in other organizations (if not involved) may be lost or difficult to access. • Additional funding may be required to establish the new SPE prior to toll revenue being collected (new buildings, staff, etc.). However new staff will be required for any Government enforcement activity anyway • The legal review (Section 4) suggests that an SPE requires more legislative change than using an existing Government body |
| <p>Opportunities</p> <ul style="list-style-type: none"> • Possibility to clearly delegate operational policy to the organization best able to make day to day decisions • Possibility to provide a more flexible operation / service to users in order to respond to operational challenges • Possibility to extend to other toll roads, tunnels, river crossings etc • Acting as a focus for new innovations • An umbrella for data sharing | <p>Threats / Risks</p> <ul style="list-style-type: none"> • As legislation is required to establish new SPE this may result in extended delays to revenues* • Timescales required to set up SPE (after any required legislation) may be incompatible with procurement timescale • May be perceived as a bureaucratic body if not reacting to road users’ needs • Could create unregulated bureaucracy of its own • VAT position with respect to toll collection would need to be confirmed • If SPE cannot be set up in time for procurement start, another body would have to start operating the system and then hand over to the SPE |

The Master Implementation Plan in Part 2 examines the timing of legislation and setting up an SPE and shows that the flow of revenue is not dependent on the choice of an SPE or otherwise, as legislation and setting up enforcement and training staff is the critical path. This is key - a new enforcement body needs to be set up anyway be it part of the SPE or not.

Note that the SPE or another body is required once tolling commences for enforcement. It does not need to be in place at the time that the contract is let to the Contractor. The Master Implementation Plan identifies that the process of establishing the SPE legally and then getting it staffed and set up as an operational company finishes in August 2017.

In order for the system to go live in early 2018, the procurement process must start during 2016. Therefore the SPE cannot start the procurement (since it will not yet exist) and it can only be involved in the contract supervision from about halfway through the implementation period. So this means that RIA or some other body than the SPE will have to manage the procurement stage and implementation supervision stage. There is then a handover risk, but this should be manageable.

Setting up an SPE

The following details need to be addressed in SPE implementation:

- The precise responsibilities need to be defined; it is assumed that the scope will be all Toll Charger activities except setting of tolls and managing roads.
- It is assumed that the tolls would be used to fund road construction and maintenance. Therefore funding would need to be defined - i.e. would the SPE have a fixed annual budget, or a percentage of tolls, and would any incentives / penalties be applied for its performance? From a legal perspective, the financing of the SPE could come from:
 - The national budget on the basis of a contract with the Government,
 - From toll revenues
- The SPE may need to borrow to fund its own set up costs as well as the set up costs of the toll collection system, plus later renewal costs
- Can such a body be given the powers to issue and enforce penalties and if required to stop vehicles? It is understood that as a government body, albeit arm's length, this is possible but this is a critical element to verify.
- Do public sector pay scales apply? It is assumed that this is not the case, since part of the aim of an SPE is to give it operational flexibility.
- How does it interact with RIA in terms of implementing / maintaining roadside tolling infrastructure? Procedures would need to be defined e.g. engineering standards, approvals, resources, access to roadside electrical power supplies etc.

Impact on Operational Model

The diagrams below show the overall context model for tolling with and without an SPE.

Figure 2. Context Model with an SPE

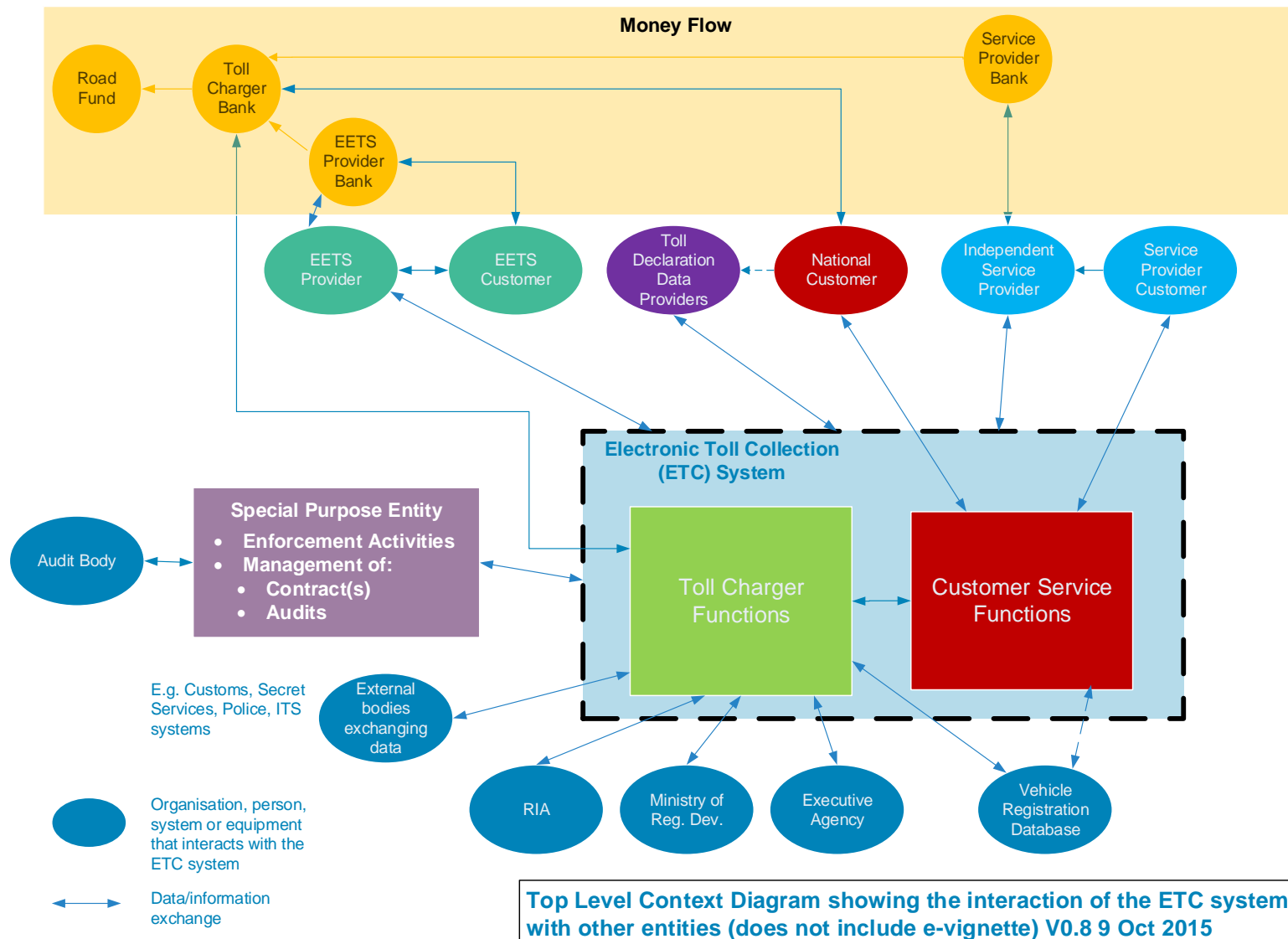
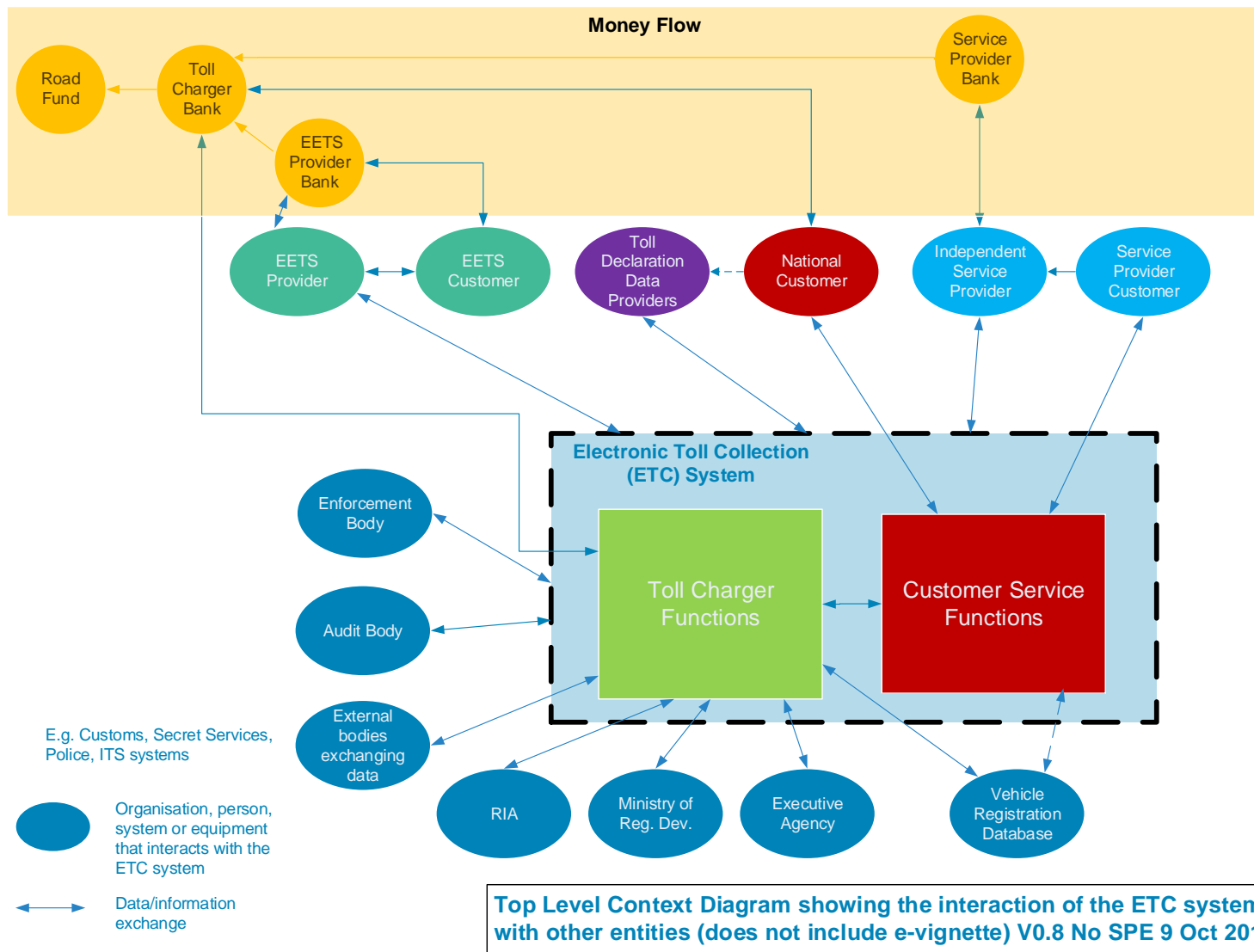


Figure 3. Context Model without an SPE



The key differences are:

- The SPE becomes the enforcement body, and without an SPE this is not yet assigned
- The SPE provides a clear link to auditing
- The SPE provides clear management of both government functions and the of ETC System / Service Contract

Conclusion

The above analysis shows that the SPE model has few real weaknesses but many strengths, and we have assessed the risks as manageable. Hence it is recommended that an SPE approach be considered for tolling operations, with an existing body starting the procurement. Whatever option is chosen an enforcement body must be set up.

C Toll Collection Operations

Overview

Whatever body is determined by Government will appoint a Contractor to develop the systems and services. As defined in deliverable 1, e-tolling will be based around GNSS on-board equipment mounted in toll liable vehicles to provide data and these data will be provided by a combination of other bodies:

- **National Service Providers (NSPs).** These are independent companies who provide e-tolling services to users in Bulgaria, collecting location data and dealing with users' invoices and payments. They may be for example fuel card providers.
- **EETS Providers (EPs).** These provide services to users in Bulgaria and in other EU countries, using a single on-board unit and account for all countries. There are at least 12 EETS providers setting up across Europe.
- **Toll Declaration Data Providers (TPs).** These only provide location data and not payment methods. They will typically be fleet management companies.

The location data they all collect are passed to the Contractor, who then calculates the toll due. Claims for tolls are then passed to the NSPs or EPs for payment and collection in turn from users. Tolls incurred by users of TPs are collected directly from those users by the Contractor.

The detailed responsibilities of these bodies are set out in sections 2.3.2 to 2.3.5. Note that in addition to market driven NSPs, there should be a dedicated NSP operated by the Contractor also. This will ensure that when the system starts operation there will be at least one NSP available and to provide for any users who are unable to conclude a contract with an independent NSP, for example because of poor credit history.

An on-board unit has traditionally been a dedicated device for tolling, with high performance but also high cost. Market trends are now to supplement or even replace such equipment with fleet management units, or hybrids of smartphones with tolling equipment. Vehicles are becoming more and more connected and will soon provide the location data needed for tolling themselves as line fit equipment. This is a fast moving area - new products were announced in October 2015 that reduce costs and complexity by using more of the

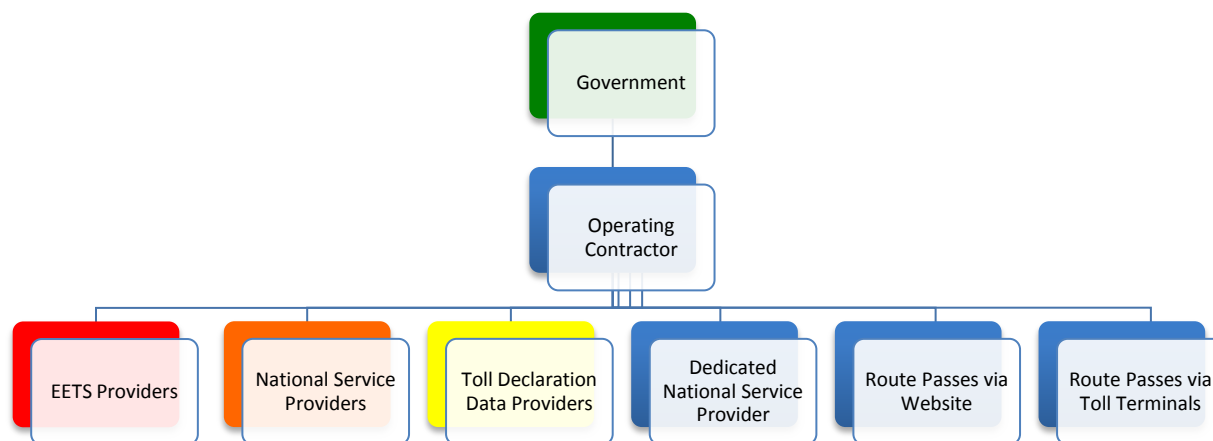
capabilities of a smartphone. It should be left to the Service Providers and the Contractor to determine the best value and easiest-to-use solutions.

For occasional users, the cost of even a simple on-board unit / smartphone may be disproportionate. Other users may not wish to have a contract with a Service Provider. For these users, the option of a “route pass” will be available. This allows a user to drive once from A to B within a specified time window. The charge is based on the vehicle’s class and the distance between A and B and is therefore compatible with the “Euro-vignette” Directive (see Section 4.3 of Deliverable 1). The most likely users would be foreign vehicles occasionally transiting Bulgaria. Purchases would be carried out electronically, with the user providing vehicle details (registration, vehicle class), route, and date planned either on-line or at kiosks. The system would calculate the toll due, which the user would pay in advance. On payment, the route pass would be recorded in the central system.

An e-vignette for light vehicles is very similar. The difference is that the charge made is not per kilometre and the user is not limited to a route between two points. Since users do not require accounts or on-board units and the details of the purchase must be recorded immediately in the database, there is little advantage in using NSPs for the sale of e-vignettes and route passes. These services should be provided just by the Contractor. Route passes and e-vignettes can be purchased via a website or at toll terminals located conveniently at service stations, border points, etc. The Contractor may choose to sub-contract aspects of this, for example to Customs.

The alternatives that exist for the user to pay tolls are illustrated below.

Figure 4. Options for Payment



In the diagram above, the blue boxes indicate ways to pay provided by the Contractor. Other coloured boxes are carried out by other organisations. The e-vignette is not shown but would be bought on-line or through a call center, post office or smartphone app. The RIA LIMA app is an ideal route for e-vignette registration.

The Contractor

The responsibilities of the Contractor include:

Preparation of the Toll Domain Statement

This formal statement describes matters such as:

- The extent of tolling (road network, bridges, tunnels, ferries)
- Publishing toll liable vehicle classes and rates applicable and exemptions
- Contractual terms and conditions for contracts between Government and potential NSPs, EPs and TPs. These cover financial matters, Key Performance Indicators, and validating that the on-board units of NSPs, EPs, and TPs function correctly. Some of these terms and conditions may be set by Government, others may be more technical requirements defined by the Contractor.

The Contractor will be responsible for producing the Toll Domain Statement on behalf of Government. Some of the data required, such as road data, may come from Government. However, the Contractor should be required to produce GIS data for the precise identification of roads and will be required to define how the NSPs, EPs, and TPs are to provide location data.

Suitability for Use Testing

So that tolls are correctly charged and collected (and that users are correctly penalised for non-compliance), it is critical that the location data provided are accurate, complete and timely. When a Service Provider wishes to establish a contract with Government, the Contractor will carry out tests to check that the on-board units and systems provided and used by the NSP, EP, or TP are suitable for use in Bulgaria.

Toll Calculation

The Contractor will receive data from NSPs, EPs, and TPs based on the location data produced by on-board units. On the basis of this, the Contractor will be responsible for calculating the correct toll due. The location data received can in general be presented in one of two forms:

- Raw GNSS location data (this vehicle was at these coordinates at this time)
- Toll object identification data (this vehicle was detected on this toll object - road segment, bridge, tunnel - at this time)

It is the responsibility of the Contractor to define how he requires location data to be received. This forms part of the Toll Domain Statement above.

The location data received from the NSP, EP, or TP will also include the on-board unit identifier and vehicle class data related to that on-board unit.

Toll Collection from NSPs and EPs

The Contractor issues claims to each NSP / EP for the tolls incurred by their users. The frequency of these claims and the time lag between tolls being calculated and the claim being made is defined in the contract between Government and the NSP/EP.

Generally, a single claim for payment will be made, covering all tolls incurred by all users. To support this, the Contractor also provides to the NSP / EP, full details of tolls incurred, specifying each individual road segment on which a toll has been incurred. How often and how quickly these supporting data are passed is also defined in the contract. The supporting data and the claim for payment do not necessarily have to be passed together. How quickly the payment claim is made is driven by the financial requirements of the Government, and how quickly the supporting data are provided is driven by how quickly the NSP / EP wishes to track the liabilities being incurred by his users.

Note that the Contractor does not issue claims to TPs for tolls incurred by the users of that TP. This is discussed separately below.

The Contractor is responsible for tracking the collection of payments of toll claims by the NSP / EP. Whether these are made direct to the bank account of Government or of the Contractor (who then transfers the funds to Government) depends on whether the Contractor is liable for the actual collection of toll claims. In the latter case, the payments would be made to the Contractor's bank account, who in turn would pay Government. Although this would reduce the risk of toll collection to Government, it would impose a corresponding risk on the Contractor, which would be reflected in the price charged.

Toll Collection from Users of TPs

Many vehicles already have GNSS-based equipment installed for fleet management, insurance, or track-and-trace services, which can also potentially be used for e-tolling. The rise of smartphones and connected vehicles will add more options. There are significant advantages to this:

- Users do not have to install a separate on-board unit, reducing complexity
- Re-use of existing on-board equipment lowers the overall costs of the system
- It may be possible to start the e-tolling system operation more quickly
- Since the existing on-board equipment has been installed for business reasons important to the fleet owning company, it is less likely that it will be switched off to avoid paying tolls. Compliance rates may therefore be increased

Where the operators / suppliers of the on-board equipment are also equipped to bill their users for tolls incurred and to collect tolls, they may choose to become full National Service Providers. However, in most cases they would simply act as a Toll Data Provider (TP) and send positional data ("Toll Declaration Data") to the Contractor, in the same way as an NSP / EP does.

Unlike an NSP / EP, the TP would not be responsible for billing the user. Instead, the user would set up an account with the Contractor who would then bill the user directly and collect the tolls.

The potential disadvantages of using Toll Data Providers are:

- Adding a new type of entity to the institutional / operational model adds complexity and hence risk and cost
- Although this model is not new, having been implemented notably in Hungary, it has not been standardised in the same way that the “pure” Service Provider model has been. Therefore there may be more difficulties in implementing this model
- There may be many Toll Declaration Data Providers. For example, in Hungary there are 22 such entities with 50 different on-board unit types. Such numbers would add a significant burden of contract management / on-board unit verification for the Government and its Contractor.

Sales of route passes and e-vignettes

A route pass or an e-vignette is simply an entry in a database that a user has the right to use a road or roads at a certain time. The Contractor will be responsible for establishing the appropriate sales channels - e.g., website, call center, post office, apps (including the LIMA app) agencies (e.g. petrol stations). In particular, it is recommended that a major distribution channel should be through Customs posts at border crossings as:

- The major requirement for route passes and short duration e-vignettes will come from foreign vehicles transiting Bulgaria. Thus the entry point to the country is a logical place to sell route passes and e-vignettes.
- Customs posts already sell paper vignettes and thus have the experience and procedures in place to sell route passes and e-vignettes. Naturally, the systems will require modification and interfacing with the Contractor’s system to record sales made in real-time

Since the prices of route passes and e-vignettes will be directly linked to the vehicle class (MPGVW, emissions class), the Contractor will be responsible for verifying the class declared by the user in the same way as an NSP, EP or TP (see NSP below).

Responsibility for Communications and general customer information

Central Government typically will define a communications programme as Ministers will want to be seen to be overseeing the deployment. They will define the “look and feel” of the tolling brand, engage with senior stakeholders in industry and user groups, and deal with the media proactively. Below this, the Government body (SPE or other) and where required the Contractor will be responsible for providing to the general public and to users general information about the e-tolling and e-vignette system. This will include:

- The extent of the toll road network, including road classifications
- Toll tables
- Information on enforcement and penalties for non-compliance
- Information on NSPs, EPs and TPs and how users may register with them

- Information on any disruptions

The above information will need to be provided via website, call center, newspaper or TV advertisements, brochures etc. as appropriate. They will need to work closely with Government regarding policy communications. Typically in tolling projects Government delegates the development of the material to its Contractor within guidelines and approves all communications.

As the contractor will not be in place for some time, this communication work needs to start well before any procurement begins, for example:

- To “sell” why tolling is necessary to the public and fleet operators
- To explain the move to an e-vignette
- To show that Bulgaria is not alone in tolling to make roads better
- To inform users of likely toll rates, so fleets can add these cost to their customers’ contracts
- To quell any false rumours and disinformation

There are many national schemes that have failed to reach procurement / operation because this user engagement did not start early enough, and rumour and misinformation meant a groundswell of public opposition built quickly.

Support to SPs in resolving customer issues

Users will interact directly only with their NSP / EP, and a user with a billing or similar query will turn to them first. However, since the calculations of tolls due are carried out by the Contractor, the NSP / EP will not always be able to resolve such queries and will turn to the Contractor for help.

Resolving customer issues of TP users

TPs only provide location data to the Contractor and it is the Contractor who bills the user. In such a case, the user will turn to the Contractor to resolve all queries. Since it is the TP who was responsible for registering the vehicle for e-tolling purposes, the Contractor may need to turn to the TP for vehicle class registration information required to resolve a customer query. Issues relating to the on-board equipment supplied by the TP would need to be resolved by the TP and not the Contractor.

Reporting

The Contractor will be responsible for providing comprehensive reporting to Government on all aspects of e-tolling and e-vignettes, including reports on system performance and operation and financial reports.

RIA will retain responsibilities for:

Working with Ministry of Regional Development and Public Works to provide data to the Ministry regarding the road network (operational and financial) and tolling data to enable the Ministry to set toll rates.

Government (SPE or other) will retain responsibilities for:

Providing the Contractor with relevant information about the toll network and rates, exemptions, details of Service Provider and EETS Provider contractual framework and other information required for the Contractor to produce a Toll Domain Statement.

In establishing contracts with NSPs, EPs and TPs, although Government will be supported by the Contractor in its negotiations, the formal contract will be between Government and the relevant NSP/EP/TP. The contract with the NSP, EP, or TP will need to cover technical matters such as details of interfaces. These may be included in the main contract with Government with the Contractor being a party to that contract, or they may be covered in a separate contract.

Contractual Relationship between TC and Contractor

Government should appoint a single Contractor to carry out all duties on behalf of Government (apart from any enforcement duties which need to be carried out by a separate enforcement body as discussed below). The Contractor may of course appoint sub-contractors but it will be his responsibility to manage them and not Government's and he will be responsible to Government for their performance.

The contract between Government and the Contractor will be for the delivery of a service and will include a series of Key Performance Indicators (KPIs) which the Contractor will be required to meet. Failure to meet these will result in contractual penalties.

The KPIs should cover all aspects of the service, such as accuracy and timeliness of toll calculation, accuracy of violation detection, customer information availability etc. However, whilst it is important that all aspects of the service be covered, they should be limited to the most essential ones. Experience in other countries shows that too many KPIs can be unmanageable and that focus can be distracted from the most important ones.

It is also important to note that the contract is not governed solely by the KPIs. They are specific measurable parameters. However, just because the Contractor meets the KPIs does not absolve him from meeting other contractual requirements.

The contract between Government and Contractor should also include a change mechanism, including how changes are to be agreed, what constitutes a change which the Contractor is entitled to be remunerated for and how that remuneration is to be established.

National Service Providers (NSPs)

Although an NSP will only operate in Bulgaria, this does not necessarily mean that its customers will be exclusively Bulgarian. In the long term, users who use toll services in other countries are likely to use an EETS Provider but in the short term, a non-Bulgarian user may choose to register with a Bulgarian NSP, as:

- No EETS Provider yet covers Bulgaria; or
- The user's EETS Provider does not yet cover Bulgaria (an EETS Provider has up to 2 years from first registration to establish contracts with all European toll domains); or
- Other countries in which the user travels do not operate electronic toll systems (e.g. Greece) or are not compatible with EETS (e.g. Turkey)

The responsibilities of the NSP include:

Ensuring the provision of on-board units to users; Registering and verifying vehicle class data

In most cases this will mean actual supply of an on-board unit, but where the vehicle already has a GNSS unit fitted (which may in the future be a smartphone), this may mean ensuring that the already-installed unit is suitable for e-tolling.

Where the on-board unit is supplied by the NSP, it is the NSP's responsibility to organise the distribution and, if required, fitting. Distribution points can be located wherever the NSP sees fit, for example at petrol stations. A logical option is at border crossing points, to allow vehicles coming into Bulgaria to acquire on-board units and register for e-tolling immediately on entering Bulgaria. This requires sufficient space to set up such a distribution center or multiple centers for many NSPs, including parking. Unlike the sale of e-vignettes and route passes by Customs, the distribution of on-board units, although located at border crossings, would be independent of Customs.

Associating the on-board unit with a vehicle and ensuring that the correct vehicle class details (MPGVW, emissions class etc.) are correctly registered is essential. It is the responsibility of the NSP to ensure that the vehicle class details provided by the user are correct.

Verification of vehicle class can be done by physically checking the original vehicle registration documents and having the NSP's operator enter the information into their system. This potentially allows errors to be introduced into the system, either because there are errors (or forgeries) in the registration document or error in data entry. This may lead to wrong tolls and unnecessary enforcement and the possibility of users having penalties issued incorrectly.

If the NSP can have on-line access to the Bulgarian vehicle registration database to verify vehicle class details, this would improve data accuracy and hence give more accurate toll charging and operational savings in enforcement. Such access would not be unlimited. The NSP would supply the vehicle registration number and obtain back only the agreed minimum of information required. Alternatively an offline subset of the data could be provided on a daily, or more frequent, basis.

Such access would mean that since vehicle registration documents would not have to be physically presented, it would be possible for NSP users to register for e-tolling on-line and have the on-board equipment distributed by post. This would improve efficiency. Such an option would be restricted to Bulgarian vehicles as NSPs would not have access to the vehicle registration databases of other countries.

Invoicing and Collection of Tolls from Users

Once the Contractor has received location data from the NSP, the Contractor calculates the tolls due and invoices the NSP. The NSP is then responsible for invoicing the user and collecting the tolls due.

Guaranteeing Tolls incurred by Users

The NSP is responsible for payment of toll claims irrespective of when or whether the NSP is himself paid by the user who incurred the tolls. The NSP is usually required to provide some form of guarantee to Government in respect of toll liabilities, which may be drawn on by

Government in case of default of the NSP. This guarantee may be in the form of a bank guarantee, an insurance based guarantee or a parent company guarantee.

Managing User Accounts

It is the responsibility of the NSP to manage the user's account. It is entirely a commercial decision as to whether to offer pre-pay or post-pay accounts or both, whether to require guarantees for post-pay accounts or to rely on credit checks, how frequently to invoice post-pay accounts and what period to allow for payment, how many vehicles to allow on one account etc.

The NSP is liable for all tolls incurred by his users. However, if a user terminates his contract, has his on-board unit lost or stolen or breaches the terms of his agreement with the NSP (for example by not paying his post-pay invoice), the NSP will no longer wish to take liability. He then sends to the Contractor a list of vehicles or on-board units for which he no longer takes responsibility. If a vehicle on such a list is detected travelling on toll roads, he is subject to enforcement.

Pre-pay accounts in e-tolling are similar to pre-pay accounts in mobile telephone networks. However, when a mobile telephone user's pre-pay credit runs out, he will be unable to make calls. The exposure of the phone operator is therefore limited. By contrast, if a toll payer's pre-pay credit runs out, the user can still drive along tolled roads. In these circumstances, the NSP would place all the vehicles and on-board units associated with that account on the list which he sends to the Contractor, thereby relinquishing responsibility. Once the user tops up his credit, he is removed from the list.

The user remains the responsibility of the NSP until such time as the NSP places that user on the list. If the NSP tracked tolls incurred for example only once a day, then a user could run up a day's tolls for which he did not have sufficient credit. Therefore the NSP needs to keep track of the tolls on a near real-time basis. This in turn means that the NSP needs to pass location data to the Contractor immediately that he receives it from the user's on-board unit, the Contractor needs to process those location data immediately on receipt and pass to the NSP details of the tolls. This in turn has implications for the design of the Contractor's back-office.

Contractual Relationship between NSP and Government/ Contractor

The main contractual relationship of the NSP is with the Government but so there is a level playing field between competing NSPs, the contractual terms and conditions must be the same for all and are set out in the Toll Domain Statement. While minor details may vary between contracts, these cannot be significant enough to result in a legal challenge.

The key elements covered by the contract include:

- The conditions that an NSP must fulfil to enter into a contract. These may include factors such as relevant experience and financial stability. Any entity which fulfils these conditions is permitted to enter into a contract with Government to become an NSP
- The fact that the NSP guarantees tolls incurred by its users

- The level of financial guarantee that the NSP must provide and the circumstances in which the guarantee will be drawn
- How quickly the NSP must provide location data to the Contractor and how quickly the Contractor must provide information to the NSP about toll transactions
- How frequently the Contractor bills the NSP on behalf of Government and the timescales within which the NSP must pay these invoices
- The bank account into which payment should be made
- Claims procedures
- Support to be provided by the Contractor to the NSP in respect of customer queries
- Service Level Agreement (see below) and penalties for breaching the SLA
- Maximum time between receipt of a list by Contractor and the list going live
- Remuneration of the NSP by Government. This may be per transaction, per user, percentage of toll revenues, fixed monthly fee or any combination of these or other similar parameters.
- Fees to be paid by the NSP to Government for the suitability for use testing

The contract will also need to cover details of interfaces between the NSP and the Contractor and technical details of suitability for use tests. These may be included in the main contract with Government with the Contractor being a party to that contract, or they may be covered in a separate contract between Contractor and NSP.

The Service Level Agreement specifies Key Performance Indicators (KPIs). These should cover matters such as:

- Accuracy, completeness and timeliness of location data provided by NSP to Contractor
- Accuracy and speed of provision of data on tolls incurred by Contractor to NSP
- Availability of interfaces between back offices
- Response times for message exchange over interfaces
- Speed of support from Contractor to NSP for billing queries from NSP's customers

EETS Providers (EPs)

The responsibilities of an EETS Service Provider and its contractual relationship are essentially the same as those of an NSP but the key difference is that an EP provides customer service elements for many countries, using a single on-board unit and account. The EP can be based in any country in the EU and its customers do not have to be from the country in which the EP is based nor from Bulgaria. This leads to some secondary differences between an EP and an NSP.

An EP, like an NSP, will have responsibility for ensuring that the vehicle class data registered by the EP are correct. However, while it is possible that an NSP may have access to the Bulgarian vehicle registration database, it is unlikely that an EP would have access across the whole of the EU. So an EP would have to validate vehicle registration data on the basis of physical documents, unless it chose to restrict its services to users whose vehicles are registered in countries in which it did have access.

Whereas an NSP would optimise its distribution network for on-board equipment for users in Bulgaria, an EP would target customers. Thus it is entirely possible that an EP providing a toll service in Bulgaria would not have any distribution in Bulgaria.

Toll Declaration Data Providers (TPs)

The responsibilities of a TP and its contractual relationship with the Contractor / TC are similar, save that responsibilities of invoicing and collection of tolls, guaranteeing tolls incurred, and managing user accounts do not apply, with the exception of listing vehicles and on-board equipment if they are lost, stolen or cease to be customers. Similarly, the contractual elements (including KPRs and SLA) would not include such matters.

D Enforcement

Overview

An overview of enforcement in Bulgaria was provided in Deliverable 1. Since Deliverable 1, the enforcement concept has been refined to include:

- The use of EUCARIS (EUropean CAR and driving license Information System) and the Salzburg forum (a cooperation initiative between the Interior Ministries of eight European countries) to issue penalties to foreign users, in a similar way to that currently used to issue penalties for speeding offences to owners of foreign vehicles. This can be backed up by use of civil courts to follow unpaid tolls across Europe as is done in many schemes.
- Customs no longer being required to be involved in enforcement. The principal reason for initially proposing the involvement of Customs was to ensure that there was effective enforcement of foreign vehicles, which otherwise could only be enforced by means of stops by Mobile Enforcement Units. The use of EUCARIS / Salzburg Forum means that there is an effective method of enforcement of foreign vehicles and the involvement of Customs is no longer required but may be an additional benefit to be discussed
- Mobile enforcement units (MEUs) being used primarily for the gathering of enforcement data (for issuing penalties centrally) rather than for stopping of vehicles. MEUs may still be used to stop vehicles in defined cases but this will no longer be the primary purpose.

The technology for MEUs has moved on recently, with options ranging from very mobile tripod-mounted equipment, through semi-permanent sites to van-mounted integrated equipment. The choice should be left to the Contractor.

Figure 5. Semi-permanent MEU Designs



Figure 6. Tripod Temporary MEU



The proposed enforcement concept is as set out below:

- Enforcement gantries will be installed on toll roads in Bulgaria. These will wherever possible use existing traffic count structures, adding equipment where possible or at least using their power and communications. Some extra sites may be needed at key points.
- When a vehicle passes under an enforcement gantry, a digital image is captured (including its number plate) and classification equipment establishes its approximate size (which approximates to its weight class) and whether it is towing a trailer
- The system, either at the roadside or in the back office establishes whether an offence was being committed (lack of a valid on-board unit, route pass or e-vignette; vehicle class declared by the on-board unit does not correspond to the actual vehicle class)
- If no offence was being committed, the image is deleted

- If an offence was being committed, the details of the offence (including images) are sent to the enforcement body, which issues a penalty to the vehicle owner by post
- If the penalty is not paid within 30 days, the penalty is forwarded to the National Revenue Agency (NRA) for enforcement
- The NRA forwards unpaid penalties for foreign vehicles to the corresponding enforcement body in the country of origin of the vehicle for enforcement. The incentive for the foreign enforcement body to enforce the penalty is that that body keeps the revenue from the penalty - conversely any penalties sent to Bulgaria for enforcement from another country are retained by the Bulgarian enforcement body. There are other options for foreign enforcement as detailed below.
- MEUs are used to supplement fixed enforcement gantries. In general they act as moveable enforcement gantries, gathering evidence in the same way as fixed enforcement gantries, with the penalty being issued from the back office of the enforcement body and not at the roadside.
- In certain circumstances, where the standard processes are not able to automatically detect a violation, MEUs may be used to stop vehicles to check for those specific violations. In such cases, penalties would still be issued centrally

Sections 2.4.3 to 2.4.5 describe the bodies involved in enforcement and their overall responsibilities, while section 3.3.3 describes the enforcement model, including the implications of the provisions of the Administrative Violations and Sanctions Act.

The precise division of responsibilities in enforcement depends on policy decisions in:

- Access to the vehicle registration database
- Vehicle classification
- Responsibility for tracking payment of penalties

Section 2.4.2 therefore first discusses these.

The proposed enforcement concept for foreign vehicles is intended to be similar to the process used by the Police for enforcement of speeding offences. However, detailed information has not been received from the Police regarding the agreements in place governing their cooperation with foreign enforcement bodies in respect of enforcement of foreign vehicles. It is therefore not possible to say with certainty whether such agreements can be adapted for the enforcement of e-tolling and e-vignettes with respect to foreign vehicles and therefore whether the enforcement concept can be fully implemented for foreign vehicles.

In addition to the proposed enforcement concept (more fully described in 2.4.4 below), there are a number of other, non-exclusive, options. These are:

- The use of a European Debt Recovery Agency (EDRA), in a number of variations
- The use of MEUs to issue penalties to foreign vehicles at the roadside

- The use of Customs to issue penalties to foreign vehicles on exit from Bulgaria

Annex C discusses in more detail the issues surrounding the enforcement of foreign vehicles and the options available if the proposed enforcement concept proves impossible to implement **for foreign vehicles**.

Policy Areas Requiring Decisions

Access to the Vehicle Registration Database

In any e-tolling system there is a temptation for users to falsely declare their vehicle as belonging to a class which has a cheaper toll rate, for example, in class Euro 5 rather than class Euro 2. Such potential misregistration is a particular problem for e-vignettes and route passes. While obtaining an on-board unit and setting up an account justifies rigorous registration and verification, for a simple, low-value product such a complex registration is unlikely to be justified. It is quite likely that a sales route would be on-line, where physical registration documents could not be presented.

There are two options to ensure that declared vehicle class data are correct:

- Enforcement checks
- Verification at registration

Clearly, it is not practical to check every vehicle. Therefore there must be a reason to carry out such a check. For weight based classes, automatic roadside classification can measure an approximation of the vehicle's weight. If this differs from the declared weight class, then a check on the vehicle registration database can be carried out (directly in the case of Bulgarian vehicles or through EUCARIS in the case of foreign vehicles) to verify the actual vehicle weight class.

However, for emissions class, it is not possible for roadside systems to check the actual class of the vehicle. Therefore such checks would need to be carried out at random. This could be done by capturing images of vehicles and then checking the number plate against vehicle registration databases or by stopping vehicles at random and checking their documents. If such checks are carried out by stopping vehicles at the roadside, this would need to be carried out by a public body and not by the Contractor. Such random checks naturally carry a cost.

However, if bodies registering vehicles for e-tolling and for route passes and e-vignettes had access to the vehicle registration database, then rigorous verification can be carried out at registration so random checks become unnecessary. Such access would preferably be on-line and real-time but an off-line data access frequently updated would suffice.

A decision on access to the vehicle registration database by NSPs, EPs, TPs, and the Contractor therefore has a direct impact on who operates MEUs - a uniformed public body or a private body (which simply drives the MEUs around and does not stop vehicles). This in turn has cost implications (private sector employees to simply drive vehicles are likely to be cheaper than trained uniformed public sector officials).

Vehicle Classification

Deliverable 1 identified that whilst it is possible to calculate tolls on the basis of axle counts, suspension types and maximum permitted gross train weight, electronic tolling based on

these principles makes automated enforcement extremely difficult. The difficulty in all cases is establishing whether a vehicle which is declared in one class is actually in that class.

Axles and Suspension Type

Article 32 and Attachment 1 of Ordinance No-160 state that vehicles will be classed according to number of axles, vehicle dimensions and weight and other classification characteristics and that classification characteristics shall be determined by suspension type, number of axles and maximum permitted gross vehicle weight.

Vehicle suspension type does not form part of the standard EU vehicle registration document and therefore it would be extremely difficult to verify suspension type at vehicle registration. In addition, roadside classification systems are not capable of detecting suspension type.

Similarly, although EU vehicle registration documents may contain axle counts, they do not have to. While axle sensors exist, their level of accuracy, particularly in free-flow conditions, is insufficient to serve as the basis for enforcement.

Therefore the only practical way of enforcing vehicle classification based on axles or suspension type would be by means of random vehicle stops by MEUs.

In practice, classification of vehicles for the purposes of the current vignette is not done according to axle count or suspension type **and as set out in Deliverable 1 it is recommended that such a basis is not introduced for e-tolling and that the relevant aspects of Ordinance No 160 are repealed.**

Maximum Permitted Combined Train Weight

According to the Roads Act, vehicles (but not passenger vehicles) which have a Maximum Permitted Gross Vehicle Weight of under 3.5 tonnes and which are towing a trailer such that the combined maximum permitted gross train weight is over 3.5 tonnes are classified as vehicles over 3.5 tonnes.

To enforce effectively, it is necessary to distinguish between:

- A vehicle towing a trailer which does not have on-board equipment because the combination remains below 3.5 tonnes and
- A vehicle towing a trailer where the combination is above 3.5 tonnes but which is cheating.

However, automatic enforcement equipment is only able to identify that whether a vehicle is towing or not and is not able to establish the MPGVB of the trailer. It is therefore not possible to establish the combined maximum gross train weight in this way. Vehicle trailers themselves do not require on-board equipment and therefore would not be registered so their MPGVB cannot be established his way. Establishing the MPGVB of a trailer via checks with the vehicle registration database is also not feasible since trailers may not necessarily be registered in Bulgaria and not all countries require trailers to be registered. The only way to enforce in these circumstances is for MEUs to stop vehicles at the roadside.

As set out in Deliverable 1 it is therefore recommended that the toll class is set on the basis of the maximum permissible gross vehicle or train weight of the vehicle and / or

the simple fact of towing or not towing a trailer. The financial model has assumed a combination of:

- MPG/VW of the vehicle and / or Maximum permitted train weight of the vehicle
- Euro emissions class of the vehicle
- Whether the vehicle is or is not towing a trailer, regardless of the MPG/VW of the trailer

At first sight such a change would appear to be inconsistent with the Euro-vignette Directive. However, although that Directive applies to vehicle trailer combinations over 3.5 tonnes, it does not say that a vehicle trailer combination over 3.5 tonnes must be charged in the same way as a vehicle over 3.5 tonnes on its own. It simply states that for a given class of vehicle **either** a vignette charge **or** per km charge can be levied. Thus if vehicle classes were defined in a way similar to that set out below, this would both be consistent with the Euro-vignette and would permit automatic enforcement.

- Class 1 - Vehicles under 3.5t and maximum train weight under 3.5t, irrespective of whether towing a trailer or not
- Class 2 - Vehicles under 3.5t and maximum train weight above 3.5t, not towing a trailer
- Class 3 - Vehicles under 3.5t and maximum train weight above 3.5t, towing a trailer, irrespective of the type of trailer
- Class 4 Vehicle above 3.5t and below 12t and maximum train weight below 12t, irrespective of whether towing a trailer or not
- Class 5 Vehicle above 3.5t and below 12t and maximum train weight above 12t, not towing a trailer
- Class 6 Vehicle above 3.5t and below 12t and maximum train weight above 12t, towing a trailer
- Class 7 Vehicle above 12t or vehicle designed to tow a semi-trailer, irrespective of whether towing the semi-trailer or not
- Class 8 Bus

Note that this is an illustrative classification not a definitive proposal.

It will be important for a firm decision to be taken on vehicle classification at an early stage as it will affect the tender specification.

A decision on vehicle classification has a direct impact on who operates MEUs - a uniformed public body or a private body (which simply drives the MEUs around and does not stop vehicles). This in turn has cost implications (private sector employees to simply drive vehicles are likely to be cheaper than uniformed public sector officials).

Responsibility for Tracking Payment of Penalties

Once a penalty has been issued, its payment (or otherwise) must be tracked. This can either be done by the body issuing the penalty or by the Contractor. If by the Contractor, then the Government enforcement body (SPE or otherwise) must pass to the Contractor details of penalties issued - date of issue, amount, time for payment, reference number, discounts for early payment. The Contractor must have access to the relevant bank account (at least on a read basis) in order to track payments. This issue needs to be decided at an early stage as it will affect the tender specification.

Contractor Responsibilities

Infrastructure Provision

The Contractor is responsible for provision of the enforcement roadside infrastructure, i.e. enforcement gantries including ANPR cameras, vehicle classification etc. It may be possible to utilise the existing traffic count camera infrastructure. However, there are significant differences between these cameras and tolling system enforcement cameras. These differences include:

- Tolling enforcement gantries include additional equipment such as additional cameras
- Tolling enforcement gantries require complex roadside control systems

Thus in practice such sharing of structures may not be possible. However, this can be established at the tender specification stage. At the very least these sites provide power and communications and maintenance access useful to help tolling.

The Contractor is also responsible for providing the Mobile Enforcement Units including all relevant enforcement systems. Responsibility for maintaining them lies with the Contractor. Responsibility for day to day maintenance (fuelling, cleaning etc.) of any vehicle used lies with the entity operating the MEU, which may be the Contractor whilst regular maintenance (e.g. servicing) may lie with either the Contractor or the entity operating the MEU.

List Management

NSPs, EPs and TPs are responsible for providing the Contractor with lists of on-board units which are no longer valid. Driving with such a unit means a violation is being committed. The Contractor is responsible for managing these lists and in particular for distributing them to the enforcement gantries and MEUs.

Depending on the design of the Contractor's system, he may also receive other lists from NSPs, EPs, and TPs - for example lists of valid on-board units or exempt vehicles. The Contractor is also responsible for managing these lists.

Operating MEUs

As discussed above, the role of MEUs is primarily to act as moveable enforcement gantries. If in addition they are used to stop vehicles to check for violations then any MEUs which are being used for that purpose would have to be operated by a public enforcement agency. However, any MEUs used solely as moveable enforcement gantries would be operated by the Contractor.

Violation Validation

There are two stages of violation validation which the Contractor is responsible for:

- Establishing that a violation may potentially have occurred
- Checking that the evidence supporting the potential violation is correct

Establishing that a violation may potentially have occurred

The process which the system goes through to establish whether a potential violation has taken place is described in Section 3.3.3. At the end of this process, an “Evidential Record” is created, which contains as a minimum:

- Images of the vehicle allegedly committing an offence, including a close-up of the number plate and a context image showing the location of the offence
- The vehicle registration number read from the number plate image
- Time and place of the offence
- Offence allegedly committed (e.g. no on-board unit detected)
- Relevant supporting evidence (e.g. data obtained from the on-board unit or from lists supplied by NSPs, EPs or TPs)

This also filters out vehicles which are known to be exempt from tolls and which therefore are not committing an offence. It is important to note that if a vehicle is not committing an offence, then all images taken and associated data are deleted from the system.

The process of creating Evidential Records and validating them is continually adjusted over time. In particular, it can be expected that as the Contractor and the Enforcement Agency gain experience in enforcement, that it may be necessary to change processes or change aspects of the law, which may have an impact on processes. The tender specification for the procurement of the Contractor should allow for such changes.

Passing Evidential Record to the Enforcement Body

Validated Evidential Records are passed to the enforcement body for further checks and issuing of penalties.

Tracking and reconciliation of penalty payments

The Contractor may be responsible for tracking the payment of issued penalties and reconciliation of payments with outstanding penalties (see above).

Enforcement Body (SPE or other) Responsibilities

Operating MEUs

MEUs primarily act as moveable enforcement gantries. If in addition they are used to stop vehicles to check for violations they would have to be operated by a public enforcement

agency. Any data gathered in automatic mode would be sent to the back office and processed in the same way as from a fixed enforcement gantry, as discussed above.

Validation of Evidential Records

The Evidential Records serve as the basis for the administrative process. The enforcement body is responsible for further validation to establish to the standards of the Administrative Violations and Sanctions Act that a violation did in fact take place. This may include:

- Checks against the vehicle registration database if the Contractor does not have access
- Checks of vehicle data against international vehicle registration databases through EUCARIS if the Contractor does not have access
- Obtaining owner data from the Bulgarian and international vehicle registration databases. Even if the Contractor is able to obtain data from the database, it is possible that data may be considered sufficiently sensitive that the Contractor will not have access to this. Owner data are required to establish to whom the penalty is sent
- Checks against any other sources of information, such as lists of exempt vehicles received from the police
- Investigating any extenuating circumstances with the owner.

The enforcement body is responsible for providing feedback to the Contractor resulting from the validation process. For example, if owner checks establish that a particular vehicle is exempt by virtue of its ownership, this should be fed back to the Contractor so that further evidential records for this vehicle are not sent out. The Contractor does not necessarily have to be told who the owner is - simply that the vehicle is exempt. In addition, any vehicle data obtained from vehicle registration databases which the Contractor does not have access to, such as the actual vehicle weight class should be fed back to the Contractor.

Issuing Penalties

Penalties are issued in accordance with the Administrative Violations and Sanctions Act and as such can only be issued by an authorised public enforcement body and cannot be issued by a private Contractor, even if acting on behalf of the Government.

In a manner similar to the procedures used by the Police for issuing penalties for speeding offences to Bulgarian vehicles, penalties are issued centrally by post to the owner of the vehicle. No penalties are issued at the roadside.

In a manner similar to the procedures used by the Police for issuing penalties for speeding offences to foreign vehicles, unpaid penalties for such vehicles are sent to the enforcement body in that country. To give that foreign body an incentive to pursue the penalty, the foreign enforcement body keeps the revenue raised (the Bulgarian enforcement body keeps the revenues raised from any penalties sent or enforcement to it by foreign enforcement bodies). It should be noted that the aim of enforcement is not a revenue-raising exercise but to provide an incentive for users to comply with their tolling obligations.

An alternative used in many countries is to pursue the debt from a foreign vehicle in civil court using a specialized European Debt Recovery Agency.

Enforcement of penalties

It is usual practice within many countries for a discount to be given if penalties are paid promptly. In Bulgaria, there is a 30% discount on speeding penalties if paid within 30 days. If a penalty is not paid within 30 days, it is sent to the National Revenue Agency for enforcement and recovery. Any costs incurred by the NRA are added to the penalty. Penalties sent to foreign enforcement bodies are of course handled according to the procedures of that body.

Tracking and reconciliation of penalty payments

The Contractor may be responsible for tracking the payment of issued penalties and reconciliation of payments with outstanding penalties (see above).

Creation of Enforcement Body

There are 4 potential options for establishing a tolling enforcement body:

- Widening the duties of an existing enforcement agency such as Police or Customs
- RIA
- The SPE
- A new dedicated enforcement agency for roads

The Police have indicated that they focus on offences which result in fatalities and that enforcing tolling violations would not fit with this focus. Furthermore, they indicated that they lack resources to fulfil their existing duties related to speeding etc. An advantage of using the Police would be the experience that they have of issuing penalties for speeding.

Customs have indicated that they would be prepared to issue penalties to vehicles at the border and to collect payments, provided that they were provided with complete documentation of the violation such that they could simply collect the penalty revenue. In effect, Customs would simply act as a collection agency - a separate body would still be required to issue penalties. Moreover, Customs would only enforce at the borders - a separate agency would be required to enforce at the borders. This approach may be appropriate for vehicles registered in countries which are not part of EUCARIS and with which Bulgaria does not have agreements to enforce each other's penalties.

Although RIA has powers under the Roads Act to enforce vignettes, in practice these powers are little exercised. Thus in many respects using RIA as an enforcement agency would be like setting up a new body as new resources and skills would be needed.

Lastly, it would be possible to set up an entirely new enforcement body, either as a separate body or as part of the SPE. The chief advantage of this is that a dedicated agency would not have other enforcement responsibilities and could be optimised for e-tolling enforcement.

Whichever approach is decided upon, the enforcement body must be set up quickly so that it can participate in the initial design of enforcement. Experience from other countries shows that if they are not involved at an early stage, the process takes time to be optimised after the start of tolling. In setting up the enforcement agency, it is recommended that representatives of the Police are seconded for a period to share their experience.

In setting up a tolling system, it is essential that room is found in the government budget for setting up and running the agency - staff, training, accommodation, IT, postage for penalty notices. It is often the case that the focus is on the budget for the tender for the Contractor and this element, which is not funded directly through the tender, is overlooked.

E Other Bodies

Vehicle Registration Database

Access will be required to data from the vehicle registration database. Ideally, access should be granted to the NSPs, EPs and TPs as well as the Contractor but at a minimum, access must be granted to the enforcement body. Access needs to be on-line and real-time if possible but for bodies other than the enforcement body offline can be acceptable. Appropriate interfaces will need to be defined and built. The volume of enquiries is likely to be high which may mean that the capacity of the database may need to be expanded or an offline copy taken.

Audit Body

E-tolling systems are large and complex and the amounts of money collected through them significant. It is likely to be necessary to appoint an audit body to ensure that the system is performing accurately, that Key Performance Indicators are being met, and that all tolls are being charged and collected.

Bodies Requiring Data from Toll System

An e-tolling system generates large amounts of data used for purposes other than e-tolling. Various bodies such as Police, Customs, and RIA have expressed interest in such data. These data should be placed in a separate depository such that they do not have an operational impact and made available to authorised bodies to carry out their own analysis. Early consideration should be given to the sizing and performance of this depository, the formatting and organisation of data, interface and security requirements, and how the depository should be funded. The interested bodies should be involved at an early stage.

Consideration must be given to Data Protection implications. Even if raw data were anonymised, analysis of the data could enable persons or firms to be identified. For example, traffic analysis could identify a traffic hub at a given location. A simple search could identify the owner of that location and hence who he is trading with. Although the system would only be providing raw data and not carrying out such analysis, careful consideration must be given to whether this would nevertheless breach Data Protection requirements.

Based on discussions held with Customs and Police, a number of use cases have been developed which relate to data use by these bodies. These are discussed in Appendix 1 and will be developed further with the relevant stakeholders in the next stage of work in preparing the tender specifications, as part of the stakeholder requirement capture activities.

F Conclusions

- The proposed institutional model is based around the Toll Charger / Service Provider model upon which the EETS Decision is based
- A single Special Purpose Entity (SPE) can fulfil all Toll Charger roles apart from road management and setting toll rates which remain the responsibility of RIA and the

Ministry of Regional Development and Public Works respectively. It will not be able to be in place to start procurement however.

- Provision of GNSS units which are provided by a combination of :
 - National Service Providers (NSPs) providing e-tolling services to users only in Bulgaria
 - EETS Providers (EPs) providing e-tolling services to users in Bulgaria and in other EU countries, using a single on-board unit and account for all countries
 - Toll Declaration Data Providers (TPs) providing location data to the Contractor but not providing a full Service Provider service to their users
- The Contractor also fulfils the role of a dedicated National Service Provider (NSP) and customer billing functions in relation to users of TPs
- Government must fulfil the enforcement role and whatever choice is made, this body needs to be set up quickly so that it can participate in the detailed design
- For ease of enforcement, tolling should not be based on axles, suspension or weight of combined vehicle and trailer
- Efficient enforcement requires on-line access to the vehicle registration database for enforcement purposes and at least offline access for vehicle and owner checks

3 Technology and Operational Model

A Overview

Objective

This section addresses the TOR requirement.

Developing a model for the operation of the system for electronic toll collection (tasks, responsibilities, workflows, interfaces, etc.).

The following sections describe the main business processes involved. The functional architecture for the system and organizational model is also described. The responsibilities and main processes of the Contractor are also described, together with processes to be supported by other parties such as Government.

Firstly, four key high level questions are considered which are:

- What are the main technology-related risks and how should they be managed?
- How to ensure adequate whole life maintenance and support?
- What activities does Government wish to be involved in as part of implementation/operation of the system?
- What type of technical competences and experience are needed to implement and operate the system?

What are the main technology related risks and how should they be managed?

E-tolling systems are now extensively deployed throughout the world. All of the main technology-related risks are well known and can be managed effectively. The main technology risks are actually from introducing non-standard or unique requirements for a specific country. This means the Contractor has to compromise an existing well-proven design or add new features which have not been extensively tested or for which there is no operational experience.

An e-tolling system is essentially a large financial system handling large volumes of small value transactions. So another main risk area is the inherent security of all aspects of system design and operation to be resistant to fraud, and all processes must be designed and operated within clear security policies. All elements of the supply chain such as the provision of on-board equipment to users, and the calculation and declaration of charges should be carried out within controlled processes where losses from the system can be detected and prevented.

E-tolling systems depend on data collected from road users about passages of their vehicles within the tolled road network. Risks associated with the technology for this are well understood and managed to acceptable levels.

For example, algorithms are used to generate missing parts of a vehicle's journey based on the chain of data received either by DSRC gantries or from the GNSS unit.

If fleet management devices are used to declare journey data to the Contractor there are potentially additional technical risks as the units are not designed specifically for tolling. Government may incur high enforcement costs and higher costs associated with resolving toll charging disputes but equally costs of deployment and speed of deployment are reduced. This is a manageable risk, but it depends on the approach that Government wishes to take to revenue loss compared to enforcement expenditure.

Further technology-related risks are associated with the back office itself. The possibility of a catastrophic event impacting data means that resilience strategies should be put in place to ensure that toll revenue is not lost. Back offices should be capable of being operated from a second location if for example there is a power outage affecting the main office. Software should be fully mirrored, so that loss of one data center does not prevent the system from operating and a second data center can be brought on-line seamlessly. Good practice should also be used relating to stored data and security policies should cover data storage requirements for different classes of data. The main risk here is that the security policy is either not adequate or is not followed correctly by all parties and within all processes.

Relating to enforcement, firstly the risk that a vehicle is not correctly identified and classified by automatic enforcement equipment could mean that some violation cases are not detected. For example if a vehicle is not correctly identified as being above the weight threshold for tolling, then it will not be possible to take enforcement action if the vehicle does not have a correct on-board unit for the higher weight class. Additionally, if a vehicle's number plate is not clear obscured, then automatic enforcement equipment not detect the vehicle's identity at all. Manual verification of images is used in most systems in order to overcome some of the limitations of automatic enforcement technology.

How to ensure adequate whole life maintenance and support?

Adequate whole life maintenance and support is best achieved by transferring the risk of equipment reliability and replacement to the Contractor. This ensures that responsibility for keeping the system running lies with an organization that is directly penalized in the case when a failure occurs. There will be no possibility for the Contractor to raise a dispute that for example Government has not repaired faulty equipment and that it is not possible to achieve performance requirements for toll collection. If the Contractor is also responsible for the design and selection of equipment and software for the system, the contractor will also be motivated to 'design-out' failure modes thereby increasing the long-term reliability of the system. This also means that the Contractor will be able to save costs of ongoing maintenance by making good decisions during design and procurement process.

However, failures will inevitably occur so the system should also be designed to be fault tolerant and to ensure that it can be easily maintained. The Contractor should put in place maintenance contracts that have service levels written into them to ensure that the required level of equipment availability is achieved. The service level requirements should be determined to reflect the economic consequences of a failure occurring and revenue being lost. The penalty on the Contractor for not maintaining the system in accordance with requirements should reflect the damages incurred by Government in terms of lost toll revenue and other costs.

What activities does Government wish to be involved in implementation/operation?

In deliverable 1, it was shown that the skill sets required to design, install, maintain and initially operate an e-tolling or e-vignette are unlikely to exist within Bulgarian or any other government organization due to the specialized nature of the systems. Therefore, procurement of a Contractor will be required.

This Contractor will be responsible for the quality of the complete system until handed over to the Government at the end of the contract. The Contractor will also operate tolling functions as described in section 2 and operate a Service Provider function for some categories of users to ensure that all categories of users are able to obtain an on-board unit and obtain a contract. The Contractor will also operate the e-vignette service. All revenue is passed to government and not retained by the Contractor. The Contractor is paid on the basis of a monthly service charge adjusted in accordance with performance indicators.

In all previous major tolling procurements, governments have chosen to outsource the entire system - including design, build, test, operation, and maintenance to a single contractor, so this model is well understood in the market. Only in Austria is the operation carried out directly by a government department, although it has long established expertise in the technical areas. Even in Austria, the original contract to design, build, and operate the system was let to a single private company and only once the system was successfully operating did government choose to buy-out the operation of the system.

So overall, the most important role of government in an e-tolling system is that of an intelligent 'customer'. This means that the government department or public side organization such as the SPE is focused on the Contractor who then takes on the responsibility for detailed design of the system, installation and its subsequent maintenance and operation. So the skill sets required by the public side are associated with appointing a suitable organization to deliver the system - and the ongoing revenue from the system as well as enforcement and public communications.

Whilst the Contractor would be responsible for installation of procurement and installation of roadside equipment needed for the system, a Government body such as RIA would be responsible for ensuring access for the Contractor to install equipment at suitable roadside locations. Site surveys would be carried out by the Contractor who would take responsibility for the quality of the complete installation until handed over to government.

Government will need therefore to build an organization with skills in managing a large prime contract using service levels and performance indicators for all key operational processes. This organization will need to be supported by technical and financial experts with deep knowledge and experience of how to manage the risks.

Resources from RIA will be required to facilitate the roadside work of the Contractor during installation of equipment. However, since the Contractor is responsible for the quality of the system and its operation, the Contractor should be responsible for ensuring work is carried out to necessary standards. Any specific requirements need to be communicated to the Contractor before the tender is submitted as any requirements which are communicated to the Contractor after the initial technical specifications are issued may result in additional costs.

To minimize the opportunity for costs to increase during the contract, the Contract should be based around output-based specifications rather than detailed requirements. The Contractor should decide what it needs to install where in order to deliver the service. Government, for example RIA, should decide and communicate what safety standards should apply to roadside installations.

Also the communications with stakeholders and the public are often an area Government will lead, typically due to the political impacts of the project and need for Ministers to be seen to be in control. And where the Toll Charger is also a government body, it is usual for the public side to be actively involved in the receipt of toll revenues and reconciliation of toll transactions and toll payments.

What type of technical competences and experience are needed?

Most of the technical competences are readily found within private contractors whose business is the design, installation, and operation of electronic toll collection systems. The necessary core skill sets that the Contractor must have include:

- Programme and Project management
- Quality Assurance / Supply chain quality management
- Ability to provide sustained funding over a period of 1 - 2 years for a large IT system development and implementation project requiring a large negative cash flow;
- Core organisational technical understanding of the functions and operations associated with an electronic toll collection back office system
- Core organisational technical understanding of required on-board equipment including testing and service during operation across a large volume of equipped vehicles

- Ability to procure and manage customer service facilities for the distribution of on-board units in partnership with relevant commercial fleet services and retail organisations
- Management of large volume logistics and distribution services and warehousing
- Public relations and marketing in a government services environment
- Additionally the organisation will need to have access to specific technical expertise in at least the following technical areas :
 - Wide area telecommunications
 - Electronic payment systems technologies and peripherals
 - Testing / System Verification & Validation
 - System Monitoring
 - Automotive standards for in-vehicle equipment installation and fleet management applications
 - Statistical Process Control
 - Data center service provision
 - Security Audit
 - Vehicle classification equipment and ANPR
 - Geographic Information Systems
 - Site surveying
 - Roadside structures design, installation and maintenance requirements
 - Environmental assessment requirements
 - Traffic operations and safety
 - Traffic surveys and modelling

B Functional Architecture

Background

In Deliverable 1, the system that will be required in Bulgaria was shown to have two sets of functions, those associated with the role of Government, and those associated with the role of the Service Provider in collecting tolls.

This section is a more detailed description of how the functions that have to be performed are to be implemented in the system. In section 3.3 we then describe the organisational aspects and in particular the interfaces with the envisaged different types of Service Providers.

The functions that will be carried out by the system will include:

- Operational functions (carried out in the back office)
- Commercial functions (carried out in the back office)
- Enforcement (partly carried out in the back office but also partly at the roadside and by the Enforcement Agency/Agencies, both at the roadside and in back office processes)
- Support functions (required to support the operation of the system)
- Other functions (not directly related to system operation)

Note that a subset of these functions is required for the operation of the e-vignette. As the e-vignette and e-tolling should be implemented as part of the same contract, the functions required for the e-vignette are not described separately but a commentary is added in the following text where appropriate.

These different categories of functions and the main interfaces are considered further below.

Operational Functions

The main operational functions revolve around the management of tolling transactions.

Pre-billing functions are performed during which transaction data received from on-board units or service providers are 'rated' for billing purposes and then passed to the relevant Service Provider in order to carry out invoicing and downstream payment-related functions.

In the back office of the tolling system, lists are kept of on-board units for which the EP or NSP has notified as not having a valid payment method / account. These are updated with information from the relevant Service Provider concerning on-board units which are no longer associated with valid means of payment / account, or which may be likely to commit a payment violation.

For the e-vignette, the processes involved are slightly different in that there is no transaction rating process involved since the charge is a flat rate. The enforcement processes are also slightly different since they rely on lists of valid payments, as opposed to non-valid ones. If a user is detected at a roadside enforcement station as not being on a "valid" list then the user's details are forwarded (together with necessary photographic evidence) to enforcement processes.

Commercial Functions

The Contractor undertakes rating of toll transactions. The following commercial functions will be carried out by the Service Provider:

- Invoicing & Toll Payment Collection - generation of invoices or toll statements for issue to users / customers and reconciliation of payments deducted from pre-pay accounts or received later from post-pay accounts.
- Customer Relationship Management (CRM) - including a web portal for customer account management and information provision

- Management of on-board unit status and logistical information
- Provision of statistical and KPI reports to Government, as part of a flexible Management Information System

For the e-vignette, functions are reduced because users are not charged a distance-based charge. Only the Contractor would offer the e-vignette to users as the business case for independent service providers would not be attractive.

Enforcement Functions

Enforcement functions include:

- On-board unit checking (roadside and mobile units)
- Mobile Enforcement Unit command, control and despatch (back office)
- Vehicle registration checking v database (mobile units and back office)
- Vehicle class checking (mobile units and back office)
- Manual checking of evidential records (back office)

Support Functions

Common to the delivery of all processes in the system are support functions. These include:

- A central on-line store of all transaction data, customer and other data needed in real time
- A deep data and report archive used to store historic data and to generate offline statistical reports as part of a flexible Management Information System
- A geographic database containing all position attributed data connected with system and road network assets
- System monitoring functions providing on-line and historic information about faults, maintenance and operations management data, and continuous system performance monitoring (KPIs / SLAs)

C Operational Model

Overview

Chapter 2 of this Deliverable discussed the Institutional/Organisational model - namely who is responsible for doing what. This section discusses in more detail how some key processes are carried out. Not all operational processes in the e-tolling/e-vignette system are discussed here - only those which are particularly complex or which have a bearing on policy decisions.

Since many processes span many entities they are grouped below into tolling and enforcement.

Tolling Processes

End to end process for defining “charge objects”, measuring them, and publishing in a GIS

Government is responsible for defining “charged objects” within the road network. These uniquely identify locations used to calculate tolls. They are published in a geo-referenced file format which service providers can encode into their on-board equipment to facilitate correct detection of the vehicle.

Process of User Registration and issuing of OBUs

This is part of Service Provision to users. Service Providers will require users to confirm their method of payment (bank account / credit / debit / fuel card details) and the class of vehicle for which they require to pay tolls. It is the user’s responsibility to confirm and/or provide evidence of the correct vehicle class at the time of opening an account. The class of vehicle for which the user has registered will be clearly indicated by the Service Provider.

Service providers will distribute on-board units to users by post or through service or distribution centers. On-board units should be easily installed by users to avoid the need for users to remove their vehicle from service whilst the unit is fitted.

A special process may be operated by the Contractor for issuing on-board units to users which are not accommodated by any other Service Provider. This will involve a user setting up an account directly with the Contractor. This may be a pre-pay account in which case a minimum deposit maybe required. On-board units issued by the Contractor in this Service Provider role may remain the property of the Contractor.

End to end process for electronic toll charging - NSPs and EPs

For EETS Providers and National Service Providers providing accounts to users, the process of charging is split between the Contractor and the Service provider.

The Contractor receives a toll declaration from the Service Provider, which includes pre-billing information describing the user’s travel on tolled roads. The Contractor invoices the Service Provider for travel during the billing period for all users who have accounts. The Service Provider then pays the tolls due. The Service Provider then invoices each user for the amounts billed by the Contractor and collects the payment from each user, along with an account fee.

The pre-billing information provided includes sufficient information to be able to calculate the toll due. Therefore this information must include the charged objects which each user has passed, the weight class of the vehicle and emission class of the vehicle.

End to end process for electronic toll charging - TPs

For Toll Data Providers (TPs), the Contractor carries out the toll charging process. The Contractor issues the invoice directly to the user for tolls due based on information received from the user’s nominated TP. The information received from the TP is similar to that received from a Service Provider but the TP does not include tolls in the user’s invoice for service provision for fleet management (if they wish to do this they must be a Service Provider). A separate invoice is issued by the Contractor who also collects payment from each user.

End to end process for e-vignettes and route passes

Service Providers are not involved in the sale of e-vignettes or route passes. The Contractor will provide at least a call center and website for purchase for e-vignettes. They may also use apps, such as RIA's LIMA app and other methods of payment that may develop in the future.

For a route pass, the user is responsible for declaring details of the intended journey. Payment will be made by the user at the time of booking. Payment may be made by the user by credit or debit card, or by fuel or fleet card or in some specific circumstances cash (eg at post offices).

In addition, route passes may be purchased at terminals provided by the Contractor at convenient locations such as service stations and border points. When booking an e-vignette or route pass, the user is asked to confirm details of the vehicle to identify the toll tariff rate that should apply.

Enforcement Processes

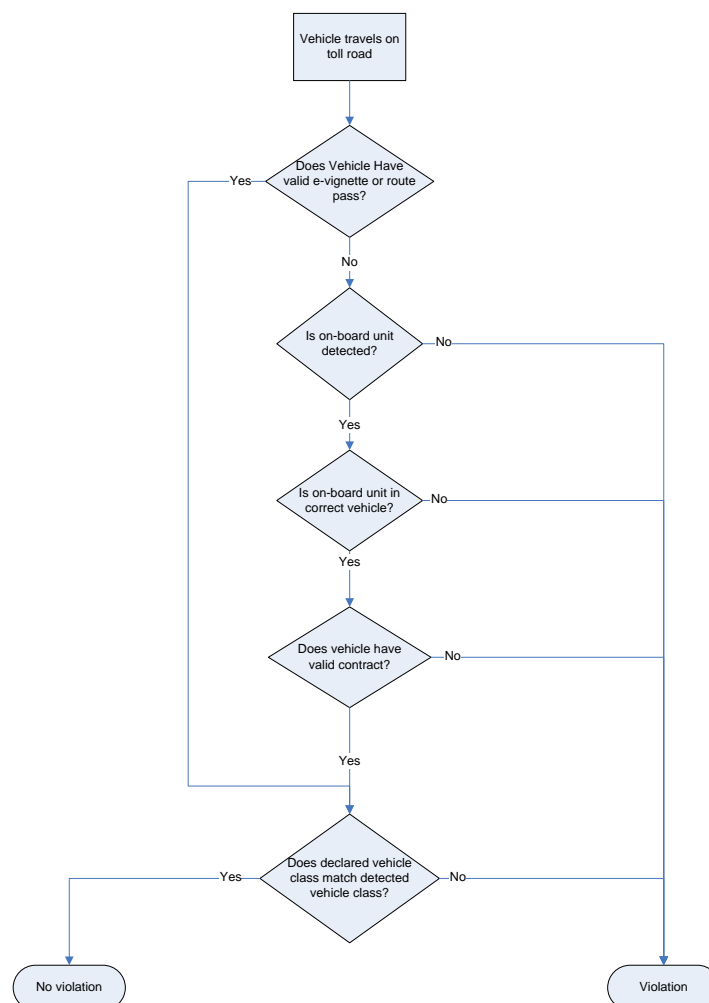
Identifying a potential violation

The diagram below illustrates the steps which the system goes through to establish whether a potential violation has taken place. Depending on the Contractor's system, these may take place at the roadside or in the back office or both. The details of this process also depend on:

- The vehicle classification system being used (see section 2)
- The access the Contractor has to the vehicle registration database

The steps in this process are discussed below the diagram.

Figure 7. Evidence Capture Summary



Vehicle passes an enforcement gantry - evidence capture

When a vehicle passes under an enforcement gantry or passes by a Mobile Enforcement Unit, its image is taken (including its number plate) and classification equipment establishes its approximate size (which approximates to its weight) and whether it is towing a trailer. If the gantry or MEU is equipped with DSRC equipment, it may attempt to communicate with any on-board equipment and the data obtained from any such transaction is recorded (see below). The number plate image is read to establish the vehicle registration number.

MEUs typically are not equipped with vehicle classification equipment and therefore would be unable to detect some offences (those involving towing of trailers or discrepancies in vehicle weight) and therefore the details of the process may vary.

Establishing whether a vehicle has a valid e-vignette or route pass

An e-vignette or route pass is simply an entry in a database that a vehicle with a given registration number has paid for the right to use certain roads during a specified period. For an e-vignette it is the unlimited right to use all toll roads during a given day, week, month or year. For a route pass, it is the right to use a single defined route once within the validity of the route pass.

The registration number of the vehicle is checked against this database to see if that vehicle has the right to be on the relevant road at the time the vehicle passed the enforcement point.

Since a route pass is a single use permit, the system notes the first passage so that subsequent passages will not count as having a valid route pass.

The system should allow for the purchase of an e-vignette or route pass up to the end of the day after the day on which travel first took place - i.e. a 24 hour grace period. If this is implemented, then once the system detects that the vehicle has no e-vignette or route pass, it suspends processing of that passage to allow time for the elapse of this grace period. At the end of this time, the database is checked again and if no e-vignette or route pass has been purchased the passage is treated as a violation. This is a customer-friendly approach especially in the early days of operation and for very irregular users. It protects Government reputation, eg if a user receives a penalty for not buying a vignette to visit a hospital in an emergency, and reduces costs of enforcement.

Establishing whether a vehicle has a functioning on-board unit

Many, but not all, on-board units have a DSRC module in them. In a GNSS-based tolling system, such as the proposed Bulgarian one, this DSRC module is not used for toll charging but can be used to establish whether the vehicle has a functioning on-board unit. Q-Free have now announced a combination mobile phone and DSRC tag that also provides this use. If the Contractor has chosen to install DSRC equipment on the enforcement gantry or in the MEU this equipment will attempt to communicate with any on-board unit. If a response is received, then it is known that there is a functioning on-board unit present and the system can proceed to the next step.

However, the converse is not true - if there is no response, this does not mean that there is no on-board unit present. The on-board unit may not be equipped with a DSRC module (e.g. OBUs provided by TPs). Even for OBUs equipped with DSRC modules there is a small but not zero possibility (approx. 1 in 1 million) that the attempted communication may fail at random. Since the Administrative Violations and Sanctions Act (AVSA) requires 100% certainty that a violation has taken place, the absence of a transaction from a vehicle which should have a DSRC-equipped OBU cannot be taken as establishing the absence of such an OBU.

So where there is no DSRC transaction, the Contractor will have to check the time and location of the vehicle passage against the location data that he has received. Since the Contractor will have to put in place such checks in any case, he may decide that installing DSRC equipment may not be worthwhile and that all checking for the presence of on-board units will be done against location data. Conversely, he may decide that filtering out non-violations as early as possible and thus reducing the load makes installing DSRC equipment worthwhile. This is a design decision on the part of the Contractor.

On-board units have programmed into them the registration mark of the vehicle to which they are assigned.

To make effective enforcement possible, legislation should be passed making it an offence to use an OBU in a vehicle to which it was not assigned.

If this were not the case, then it would be open to a user to argue that he was using someone else's OBU. If this could not be disproved, then under AVSA, since there was not 100% certainty, then no penalty could be imposed.

Establishing whether the vehicle has the correct on-board unit

If a DSRC transaction is recorded, one item of data obtained from the OBU is the vehicle registration mark of the vehicle. The system compares this to the vehicle registration mark read from the photograph taken by the gantry or MEU.

Establishing whether the vehicle has a valid contract

As indicated in section 2, NSPs, EPs, and TPs provide the Contractor with lists of OBUs and vehicles which for one reason or another are invalid. If a DSRC transaction is recorded, then the OBU identification can be checked against this to see if the vehicle is driving with an invalid OBU. Alternatively the vehicle registration can be checked against the list.

Establishing whether the vehicle's declared vehicle class matches the actual vehicle class

Most aspects of a vehicle's declared vehicle class are programmed into the OBU. However, variable aspects of the vehicle's class have to be set by the user. In particular, the user must enter whether he is towing a trailer, in accordance with the vehicle classification rules. For route passes and e-vignettes, the vehicle class is declared at the time of purchase.

If a DSRC transaction takes place between vehicle and enforcement gantry or between vehicle and MEU, the declared vehicle class is transmitted to it. Alternatively, the declared vehicle class is transmitted to the NSP, EP or TP and then to the Contractor along with the location data. This declared vehicle class is compared to the vehicle's actual vehicle class.

As discussed in Chapter 2, how the vehicle class is checked is highly dependent on the vehicle classification system adopted.

Validating the Evidential Record

Clearly accusing someone of a violation is serious and therefore there must be no errors in the Evidential Record passed to the enforcement body. An Evidential Record which has been created is therefore subject to additional checks such as:

- The read of the number plate is verified by a human operator
- The vehicle class of the vehicle is verified either by checks against the vehicle registration database, if access is available, or manually by operators where possible. This is particularly important at weight class boundaries. Vehicle classification systems are unable to precisely determine the MPG_{VW} of a vehicle. Thus around a weight boundary (e.g. 3.5 tonnes, 12 tonnes) they will err on the side of caution and create an Evidential Record for any vehicle which **may** be above the boundary while declaring itself to be below the boundary. The vehicle registration database will give a definitive answer but where not available experienced human operators are in many cases able to identify subtle differences in vehicle characteristics to identify the

correct weight class. Where the weight class cannot be identified, the Evidential Record is passed on to the enforcement agency for its validation and decision

- Whether a vehicle which has been identified as towing a trailer without declaring so it is verified by human operator as automatic systems can make errors.

If the validation process detects an error then the Evidential Record is either discarded or reprocessed depending on the error detected.

The process of creating Evidential Records and validating them is continually adjusted over time. In particular feedback from the enforcement agency that a vehicle is exempt or that the vehicle is not of the class identified in the Evidential Record is recorded so that if the same vehicle is detected again this can be taken into account in creating and validating future Evidential Records.

In addition, as the Contractor and Enforcement Body gain experience it may be necessary to change processes or change aspects of the law, which may have an impact on processes. The tender specification for the procurement of the Contractor should allow for such changes.

Enforcement of EETS Users

The enforcement of EETS Users does not differ from that of other users. Although an EP guarantees the tolls incurred by his user, he does so only provided that the user is behaving in accordance with requirements and so long as the EP has not placed the user on a list of non-valid users.

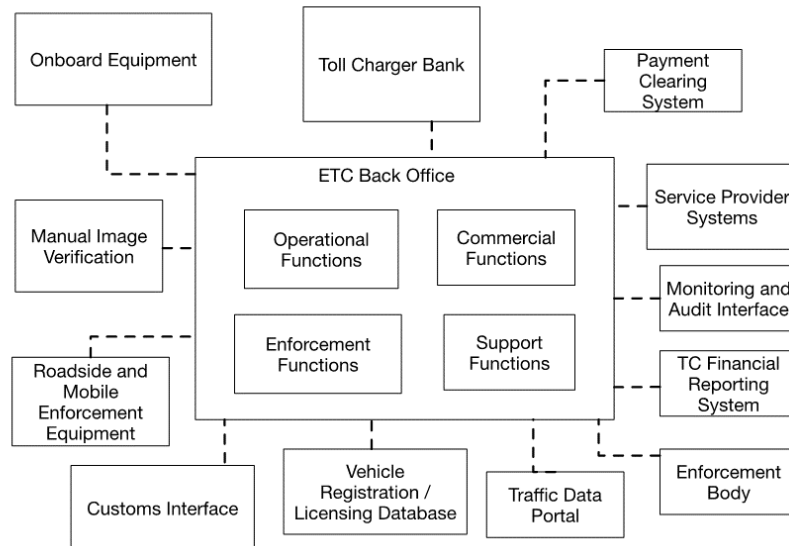
- If an EETS user has been placed on a list, then the EP has disclaimed responsibility for him. In effect, he is no longer an EETS user. Therefore, unless he has made alternative arrangements (e.g. purchased a route pass), he is committing a violation
- If an EETS user shields or disconnects his OBU, then he is travelling in breach of the EP's terms and conditions and in breach of the legal requirement to have a valid means of payment (unless he has purchased a route pass)
- If an EETS user misdeclares his vehicle class, then again he is travelling in breach of his obligation to correctly pay tolls

In each case, the enforcement systems and processes should detect the violation. The process of issuing a penalty will be identical to that for other users - the penalty is sent to the owner, not to the EP. Note however that in accordance with the EETS Decision, the EP is required to cooperate with the TC in the TC's enforcement efforts. If the enforcement body is aware that the user is or was a customer of a given EP (mechanisms exists for checking this) then the enforcement body can request (via the Contractor) information about the user (e.g.name and address) which may assist in establishing the owner of the vehicle. Note however that the user is not necessarily the vehicle owner.

D Main External Interfaces

The main interfaces to the system are illustrated in the diagram below.

Figure 8. Main External Interfaces



On-board units

For those on-board units that are directly provided by the Contractor there will be an interface to the e-tolling (or ETC) system. Note that on-board units provided by EETS providers and NSPs do not communicate directly with the Contractor but toll data is passed to via an interface (see below under Service Provider systems)

Payment clearing system

The Contractor will have an interface to an external payment clearing system which passes details of all payments received from the various payment channels. The Contractor uses this to reconcile payments received against tolls declared and payments made. This is generally a commercial off the shelf system or service providing financial clearing functions.

Service Provider systems

The Contractor's system will need to have several interfaces to:

- EETS Provider(s): back office interface in accordance with ISO 12855.
- National Service Providers (OBU issuers): back office interface in accordance with ISO 12855.
- Fleet Management Providers / Toll Data Providers: according to agreed specifications. Note that it is expected that not all such telematics providers will have implemented an interface in accordance with ISO12855. However, where possible the standard should be adopted in order to minimise the variation of interface specifications supported.

Enforcement interfaces

Interfaces also exist to the following

- Mobile enforcement equipment - operated by the Contractor in partnership with the enforcement agency
- Roadside enforcement equipment - provides image and other data e.g. vehicle class, on-board unit ID, vehicle registration number, pertaining to potential violators detected
- Manual Image Verification system - used to manually verify the correct class and identity of vehicles pre-selected as potential violation cases using roadside equipment.

As these interfaces are between equipment operated by the Contractor, they are not external interfaces from an organisational point of view.

Vehicle Registration / Licensing Database

The Contractor will need to check the correct identity of vehicles detected as possible violators. Note that this interface should if possible be automated and due to the volume of potential requests for information it should not be a manual process - particularly in the case of e-vignettes. Access to foreign vehicle registration databases via EUCARIS will be required.

Bank

Another external interface is with the bank into which toll revenues are paid. The system will need to keep track automatically of all payments made to the bank and to be able to reconcile these payments with billing details generated in respect of toll transactions. This interface adds the requirement for the system to connect directly to the bank to receive and process payments and refunds. Also, holding accounts may be required for pre-payment accounts.

Financial Reporting System

The toll revenue generated will be reported electronically and this information can be sent directly to the Government financial systems electronically if required. There will be a large quantity of data to analyze and it will be important to consider requirements for financial reporting. This data will also include information about deposits received, refunds made, reconciliation of payments by users with toll transactions, missing toll payments, and penalty payments received in respect of violations.

Traffic data portal

The system will collect statistical data regarding the traffic. An external interface for example in the form of a web service should be provided so that relevant data can be used by Government and other agencies for planning and other purposes.

Enforcement body

Whichever body is responsible for enforcement and issuing penalties to violators (as shown in the previous section) will require highly reliable violation data from the system. The enforcement body will also need to manage the violation data it receives and to manage the

issuing of penalty notices. It will need to handle private information about users' names and addresses and whereabouts and therefore will be subject to EU regulations in relation to data privacy.

Monitoring / Audit body interface

Consideration will need to be given to what data maybe required by any independent government audit body or contractor for example to verify the correctness of operation of the system or correctness of reports provided by the system. Such bodies may require unfettered access to specific data generated by the system and this may involve the extraction and manipulation of large amounts of data which can place an operational load on the system.

Customs

An interface should be established between the system and the IT system of the Customs Agency. This interface is required to allow exchange of information for:

- control over road fees (vignettes) and licensing/entry permit regimes should this be needed
- tracking the routes of vehicles transporting excisable goods, without the need to force vehicles to stop

In the case of vehicles paying via the e-tolling system, non-payment becomes part of the overall enforcement regime. In the case of goods tracking, additional reports will be required to filter journey information related to specific vehicles declaring such cargoes based on information from the customs system. Similar interfaces can be considered for the Police and other appropriate agencies such as the Executive Agency for vehicles.

Other Interfaces



Other government departments may require information for specific purposes and this information will be provided by manual exports from historic data.

E Summary of the models

User View

The diagram below summarizes the detail shown in the various technical and operational models in this section. It shows the wide variety of payment means, shared enforcement approach, and focus on foreign users, as well as flexibility for future technology.

Figure 9. User Model

| User | What they need to do | How and where they pay | How they are enforced |
|--|---|--|---|
|  | <ul style="list-style-type: none"> Use tech already in truck (OBU, smartphone, fleet management) Or buy a new OBU Or buy a route pass   | <ul style="list-style-type: none"> Account – pre pay or post pay (if good credit)  <p>Fleet management service</p> |   <p>Checks of number plates</p> <p>↓</p> <p>Penalty posted to vehicle owner</p> <p>↓</p>   |
|  | <p>Buy an evignette giving</p>  |  <p>Apps including LIMA</p> | |
|  | <ul style="list-style-type: none"> Buy a route pass Buy or rent an OBU or  | <ul style="list-style-type: none"> Account single payment or EETS | |

4 Legal Model

A Overview

This section meets the TOR requirement 2.6

Development of a legal model for the development and implementation of the system, including legal and organizational structure, contractual relationship with the system provider and the relationship of the provider with concerned agencies and institutions.

B Legal Changes Required

Overview

Legal changes need to address the following key areas:

- Amendments to permit e-tolling and e-vignettes in principle and in the specific version proposed for Bulgaria
- Creating a Special Purpose Entity (SPE) to fulfil the Toll Charger role, should this approach be selected
- Possible amendments to bi-lateral agreements with foreign governments to permit access to foreign vehicle databases and to enforce penalties for foreign vehicles

The following Acts and Ordinances will require amendment:

- Roads Act
- Road Traffic Act
- Ordinance No-160

Changes Required to Permit e-tolling and e-vignettes

The proposed changes listed below take into account the analysis of existing Bulgarian legislation and EU legislation set out in Deliverable 1. In some cases, specific textual amendments can already be identified they are set out below. Additional detailed changes regarding administrative procedures, funding, use of revenues etc. may also be required.

Roads Act

- Amendments to the Roads Act specifying how e-tolls or e-vignettes are calculated in accordance with the requirements of the Eurovignette Directive
- Amendments to the Roads Act and Road Traffic Act to remove text relevant only to paper vignettes and to insert text relevant to the operation of the e-vignette system

- Change to Roads Act to permit both vignette charges and tolls to be charged simultaneously (although not for the same class of vehicle)

The following revision of Art. 10 of the Roads Act is suggested - *“for passage along republican roads, which are included in the Trans-European road network, as well as those that are outside of it or sections thereof, the Council of Ministers may introduce **only one** of the following fees **for a given category of vehicle**: (1) Fee for the use of the road infrastructure - vignette fee; (2) Fee for distance travelled - Toll.*

- Amendments to the Roads Act to permit route passes as an alternative to e-tolling using on-board equipment
- Changes to Roads Act so that signposting of alternate routes is not required
- The Roads Act currently prohibits vignette revenues being used for new road construction. If e-tolling and e-vignette revenues are to be used for such construction, appropriate amendments should be introduced to permit this
- Amendments to the Roads Act, Road Traffic Act and Ordinance No-160 to fully transpose into Bulgarian law the EETS Directive and Decision. Specific consideration must be given to any legislative requirements to permit EETS Providers and independent National Service Providers to collect tolls
- Detailed definition in the Roads Act of obligations of users in an e-tolling and e-vignette system and therefore what constitutes a violation. For example, if on-board equipment is assigned to specific vehicles, using on-board equipment in a vehicle other than the one to which it is assigned should constitute an offence. Additional violations would include mis-declaration of vehicle class and non-payment of tolls by driving without a valid on-board unit, route pass or e-vignette

The specific provisions which need to be amended in the **Roads Act** are Art. 10, 10a, 10g, 10d, 10e, para 2, 10g, 44b, 44c.

Road Traffic Act

- Amendments to the Road Traffic Act to remove text relevant only to paper vignettes and to insert text relevant to the operation of the e-vignette system
- Amendments to the Roads Act, Road Traffic Act and Ordinance No-160 to fully transpose into Bulgarian law the EETS Directive and Decision. Specific consideration must be given to any legislative requirements to permit EETS Providers and independent National Service Providers to collect tolls
- Amendment of the Road Traffic Act to introduce penalties for violations of e-tolling requirements

The specific provisions which need to be amended in the **Road Traffic Act** are art. 100, para. 2, 139, para 5, art 165 and seq.

Secondary Legislation

In addition to changes in primary legislation (the Roads Act and Road Traffic Act) listed above, changes are required in secondary legislation (i.e. implementing acts), which are the Rules for Application of the Roads Act and the following ordinances:

- Ordinance № No-160 of July 7, 2008 on conditions and procedures for the collection of fees for the use of road infrastructure, distance travelled, use of separate facilities on republican roads and for special use of republican roads or parts thereof;
- Ordinance № H-19 of December 2, 2008 on the conditions and procedures for the release of persons with 50 per cent and over reduced work capacity or type and extent of disability, and individuals or families raising children with disabilities up to 18 years of age and until the completion of secondary education, but not later than 20 years of age, from the obligation to purchase vignette for the use of republican roads;
- Ordinance № H-20 of December 15, 2008 on the conditions and procedures for the compensation of the value of the free vignettes, received by persons with 50 per cent and over reduced work capacity or type and extent of disability, and individuals or families raising children with disabilities up to 18 years of age and until the completion of secondary education, but not later than 20 years of age, released from the obligation to purchase vignette for the use of republican roads.
- Ordinance № 104 / 20.05.2002 for the border controlling points
- Ordinance № 81213-532 / 12.05.2015 on the conditions and order for use of electronic technical means and systems for control over the obligation for circulation of the roads;

The detailed changes depend on the structure of the envisaged SPE.

Rules for Application of the Roads Act

- Amendments of references to vignette fees to refer to tolls and e-vignette fees

Ordinance No-160

- Detailed (legal) description of the new tolling system. In particular, amendments to Ordinance No-160 and the possible adoption of a new ordinance to regulate the use of automated technical means of enforcement
- Amendments to No-160 to ensure that classification of vehicles with trailers permits automatic enforcement whilst being compatible with requirements of EETS Directive and Decision and of Eurovignette Directive, as discussed in Section 2.4.2

- Amendment of Ordinance No-160 to remove requirements to classify vehicles by numbers of axles and suspension type, so as to allow for automated enforcement, as discussed in Section 2.4.2
- Amendment of Ordinance No-160 in respect of tolling to be appropriate for an electronic only system rather than a system based on manual tolling
- Amendment of Ordinance No-160 so that on-board units used only for national tolling (and not for EETS) do not need to be fully interoperable
- Amendments to the Roads Act, Road Traffic Act and Ordinance No-160 to fully transpose into Bulgarian law the EETS Directive and Decision. Specific consideration must be given to any legislative requirements to permit EETS Providers (and independent National Service Providers) to collect tolls
- Any required amendments to Ordinance No-160 to reflect decisions regarding bodies responsible for enforcement

Ordinances H-19 and H-20

- Technical changes so that existing discounts can be applied to e-tolling and e-vignettes

Ordinance № 104 / 20.05.2002 on Border Crossing Points

- Amendment or deletion of provisions relating to enforcement of (paper) vignette fee obligations

Ordinance № 81213-532 / 12.05.2015 Regarding Electronic and Technical Means of Enforcement

- Amendments to describe the technical methods of enforcement of e-tolling and e-vignettes or if such technical means are described in other ordinances, any necessary amendments to synchronise the two ordinances

Other

- Detailed legislation in new ordinances defining e-tolling and e-vignettes charges and charging rules according to types of roads and user behaviour (e.g. U-turns). If grace periods are adopted for e-vignettes and route passes, the rules pertaining to such grace periods should be covered here
- It may be necessary to introduce legislation regarding the operation of user accounts. Such legislation may need to cover documentation required for user registration, circumstances under which accounts may be suspended, warnings to users of impending account suspensions etc.

Proposals for Amendments in Ordinance(s)

In order to introduce a legal ground for the adoption of the necessary ordinances, a paragraph to Art. 10 of the Roads Act may be added stating that: *“The details of the vignette and toll systems shall be regulated in an Ordinance of the Council of Ministers assuring the compliance of interoperability under Directive 2004/52/EC and Decision 2009/750/EC.”*

The current Ordinance regarding the terms and procedures for toll collection for use of the road infrastructure regulates in detail the toll system. The greater part of text may be preserved. However the ordinance is not drafted in view of particular technical solutions and this represent a reason to suggest the adoption of a new ordinance.

Internal technical documents may be drafted for the RIA administration in order to enumerate and explain the standard procedure for each of the two systems. This will depend on the functionalities of the electronic solutions put in place.

The main structure of the ordinance in application of the new system shall contain the following main parts:

1. General Part - Payment obligations - separating vignette and tolls
2. Vignettes
3. Tolls
 - a. Obligation for installation of on-board equipment
 - b. Obligation for correctly setting up of the on-board equipment
4. Roads infrastructure description (may be in annex to the ordinance)
5. Competences of the Toll Charger and the EETS Provider (according to the EETS Decision every Toll Charger has to prepare and publish an EETS Domain Statement, in which he describes the general conditions for acceptance of an EETS Provider in his Toll Domain - therefore texts should regulate this aspect as well).
6. Exemption
7. Method of toll payment
8. Validation of the payment and right for use of infrastructure
9. Calculation of the amount of the corresponding charge
10. Control - with possible cross references with other ordinance as for instance Ordinance for the Conditions and Procedure for Control by Electronic Means of Rules for Use of Roads
11. Replacements
12. Requirements for EETS/ Service Providers (if applicable)
13. Sanctions
 - a. Breach of the obligation for installation of on-board equipment

- b. Breach of the obligation of correct set-up of the on-board equipment assuring the correct fee is collected

14. Provisional provisions - regulating the transitional period for implementation.

Changes Required to Enable the Creation of a Special Purpose Entity (if required)

There are two options for the arrangement of a special state unit intended to manage the e-vignette and e-tolling systems, namely:

- Vesting a special unit within the Road Infrastructure Agency with the respective powers to manage the system; or
- A State-owned company (an existing example is the State-owned Bulgarian Ports Infrastructure Company)

In both cases introduction of an explicit legal basis will be required. This can be done by means of an amendment to the Roads Act or by an entirely new Act. In addition, secondary (implementing) legislation will be required. In the case of vesting a special unit within RIA, this would require only a few amendments to the Regulation for the structure of RIA.

In the case of a state-owned company (which may be a single limited liability company or a single joint-stock company) the law establishing such a company, which is not a commercial company under the Commercial Act, stipulates its functions, activities, management, powers, property, any applicable limitations, prerogatives, etc. The public entity cannot act outside of the framework defined in the act of its establishment.

Since the implementation of the new system will in any case require legal changes, as discussed in 4.2.2 above, this would not entail a separate procedure for amendments.

Since RIA is an existing organisation, no further legal steps would be required. However, in the case of a newly created state-owned company, additional legal steps would need to be undertaken, which could only be undertaken after the passage of the amendments discussed above. These legal aspects are the adoption of company statutes, appointment of the Management and Controlling Bodies, transfer of rights and/or funds/registered capital and registration with the Trade Registry.

The state-owned company still needs to follow the requirements of the Public Procurement Law for awarding of all works, services, and goods necessary for the implementation of the system.

The timetable for setting up a state-owned entity, including the relevant legal amendments, is discussed in the Master Project Plan in Part 2 of this Deliverable. Appendix B gives a detailed table of legal changes.

C Procurement

Summary of Legal Requirements/Constraints on Procurement

The main constraints on procurement are as follows:

- The organisation responsible for procurement of all necessary contracts
- The timescales needed to run the procurement process
- The available budget/funding requirements for any contracts entered into.

Public Procurement, Concession PPP

One role of a state-owned company such as the SPE is taking the legal function of the Toll Charger which to a considerable extent excludes the possibility for a concession and PPP. In case of a mixed company however, this possibility could be developed.

The state company as public awarding entity

If a state-owned SPE is created, it will undertake the function of the Toll Charger. The powers of the SPE are provided for explicitly in the Act for its establishment and so cannot change from the activity stipulated in the legislation. In any case, the SPE will fall within the meaning of an “awarding authority” and will be obliged to follow the requirement of the PPL for awarding all of its supply, construction, and service needs.

Different Procedure under PPL

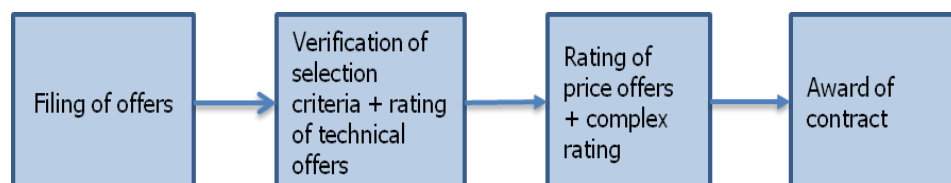
The different procedures which can be used for concluding public contracts are:

- Open procedure (art. 64 - 74 PPL)
- Procedure of negotiation with notice (art. 84 - 89 PPL)
- Competitive dialogue (art. 83a - 83h PPL)

Below is a short overview of the main aspects of each procedure

Open Procedure

Figure 10. Stages in an Open Procedure



In open procedures, any interested economic operator may submit a tender in response to a call for competition. The following are the main stages of the open procedure:

The tender would be accompanied by the information for qualitative selection that is requested by the contracting authority.

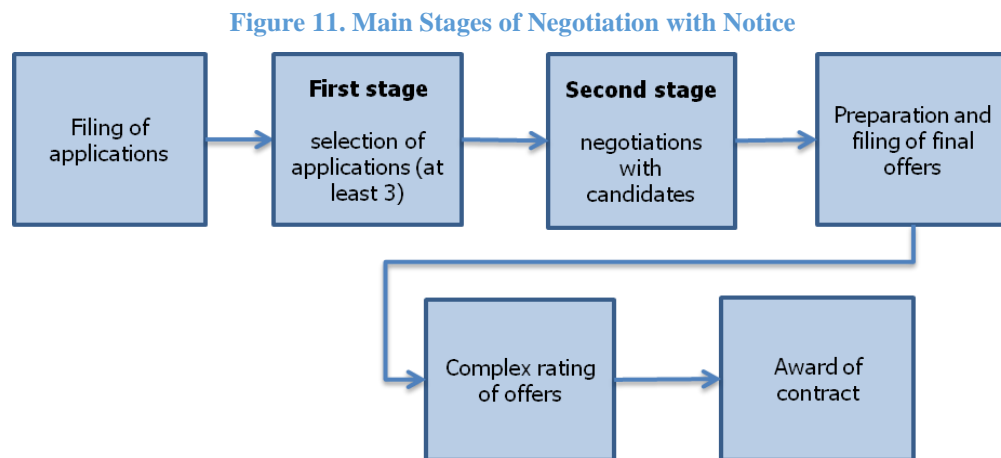
The main advantage of this procedure is that technical requirements are fixed and clear, but no modification of them is possible after the decision for opening the procedure.

The procedure is not conditional upon any specific circumstances, neither is the contracting authority obliged to motivate the choice of the open procedure.

Procedure of Negotiation with Notice

Any economic operator may submit a request to participate in response to a call. The public authority provides at the initial stage the information for qualitative selection that is requested by the contracting authority. In the procurement documents, contracting authorities shall identify the subject-matter of the procurement by providing a description of their needs and the characteristics required of the works or services to be procured.

The following are the main stages of the procedure:



The information provided shall be sufficiently precise to enable economic operators to identify the nature and scope of the procurement and decide whether to request participating in the procedure.

There are specific conditions which must be met for awarding a public contract by this means:

- The open procedure has been terminated because all offers or projects do not meet the requirements announced by the contracting authority in advance (and the initially announced terms have not been substantially changed);
- As an exception the nature of the service, delivery or of the construction, or the risks related to them, do not allow pre-determining of the value;

- The nature of the service does not allow sufficiently exact determination of the technical specifications to assign the procurement by the order of the open or limited procedure.

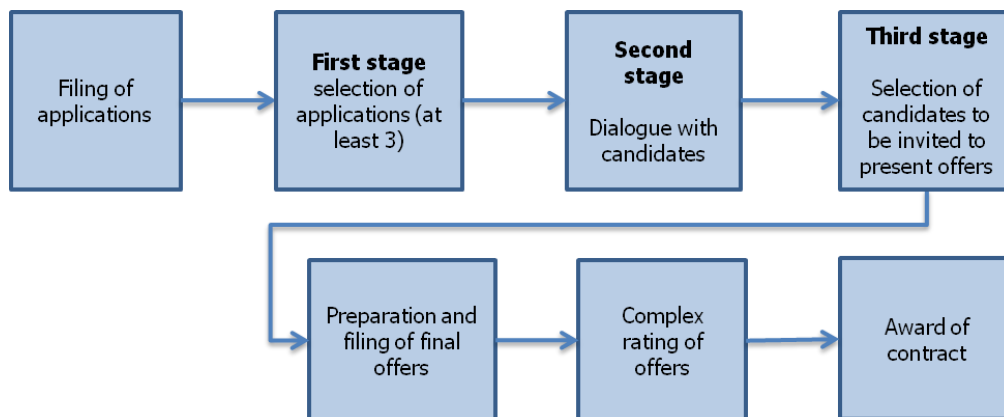
The contracting authority must substantiate in the opening decision the choice of the procedure of negotiation with notice.

The procedure of negotiation with notice is more complex. Therefore the procurement commission members have to be well trained in order for the procedure to be assigned appropriately and according to the specific requirements of the public authority.

Competitive Dialogue

Competitive dialogue is a procedure whereby any economic operator may request to participate and the contracting authority conducts a dialogue with the candidates admitted to that procedure, with the aim of developing one or more suitable alternatives capable of meeting its requirements, and on the basis of which, the candidates chosen are invited to tender. The following are the main stages of the procedure:

Figure 10. Main Stages of Competitive Dialogue



For the purpose of recourse to this procedure, a public contract is considered to be "particularly complex" where the contracting authorities:

- Are not objectively able to define the technical requirements, capable of satisfying their needs or objectives, and/or
- Are not objectively able to specify the legal and/or financial make-up of a project.

Competitive dialogue is the most complex procedure. There is practically no experience of the Bulgarian public authorities with this procedure.

The open procedure is the most common procedure in Bulgaria. Competitive procedures may facilitate the application of innovative solutions. In these cases the evaluation team appointed by the awarding authority should be very well prepared and should follow precisely the mandate stemming from the decision of the authority with regards to the procurement.

The timescales for the procurement are discussed within the Master Plan in Part 2 of this Deliverable 2. Given the time period required to establish any SPE to manage tolling operations, procurement of the system should be started by existing agencies to avoid delay to toll revenue collection. Overall management and enforcement of the system could then be taken on by the SPE once it is fully established and staffed and the technical infrastructure is installed, tested and in an operational state.

The required financing for the project is dependent partly on the payment mechanism which will be included in the contracts that are entered into. For example, stage payments to the main Contractor may be considered on completion of stages such as design, testing, installation, and commissioning of infrastructure. These stage payments would require a budget for lump sum payments to be financed by the purchaser prior to any toll revenue being collected.

If such a payment profile is chosen, the Government's cash flow can be expected to be largely negative in the first year of the contract during installation but positive thereafter and so could be financed from short term loans. If no lump sum payments are given to the Contractor with instead only service payments once the system is operational, then this negative cash flow is passed to the Contractor who will need to include additional finance costs in his charges. In this latter case, it is suggested that a longer contract period could be required to provide an optimal period for the amortization of capital costs. The financial model (Part 3) looks at the cost of this money by having a conservative 7% discount rate for NPV generation.

Proposal

Government shall appoint a Contractor to carry out all tolling service functions and to co-ordinate the collection of toll payments from EETS Providers and other Service Providers. The Contractor will also carry out Service Provision functions for some users (see below).

In addition to appointing a Contractor, Government shall also enter into the following other Contracts:

- National Service Providers (NSPs). These provide e-tolling services to users only in Bulgaria
- EETS Providers (EPs). These provide e-tolling services to users in Bulgaria and in other EU countries, using a single on-board unit and account for all countries
- Toll Data Providers (TPs). These only provide location data and do not provide a full Service Provider service to their users. The location data are passed to the Contractor, who then calculates the toll due. Claims for the tolls due are then passed to the NSPs or EPs for payment and collection from users. Tolls incurred by users of TPs are collected directly from those users by the Contractor (see below).
- Possibly, an Independent Monitoring Audit Contractor (IMAC)

The Contractor carries out no service provision functions for users who hold contracts with an approved EP or an approved NSP.

EETS Providers are not procured via a tender process. According to European Decision 2009/750/EC Toll Chargers have to accept any EETS Provider that meets the requirements of becoming an EETS Provider. This means that the process used is open and any organisation meeting certain specific requirements can apply for approval to offer EETS services.

NSPs can be procured by a tender process but it is likely that a similar process would need to be followed as for EETS Providers as the requirements are likely to be very similar so:

- The number of NSPs and EPs should not be limited
- All EPs should receive the same contract terms and reimbursement rate from Government

TPs all have the same terms and conditions of contract and remuneration rate, although these will be different from those of EPs and NSPs, since TPs perform fewer functions. As with EPs and NSPs, any organisation meeting basic requirements can apply to become a TP, so the number should not be limited and the appointment of TPs would follow a very similar model to that for NSPs and EPs.

5 Interoperability

A Overview

Background

This section meets the TOR requirement 2.10 for

Development of a plan to ensure interoperability with other Member States having a system of electronic toll collection, within three years for vehicles over 3.5 tons and five years for all other vehicles after the decision on the introduction of EETS in accordance with Directive 2004/52 / EC on interoperability of electronic road toll systems in the Community.

The obligations of the Decision are actually immediate so as soon as Bulgaria introduces an electronic toll collection system, the provisions of the EETS Decision should be implemented.

This part of the deliverable sets out an action plan for implementation of EETS services in Bulgaria. Note that for this section, the term ‘Toll Charger’ has a specific meaning when discussing EETS defined in the European Decision 2009/750/EC and refers to the public or private organization which levies tolls in an EETS domain.

It considers the current state of the market and identifies practical solutions to achieve interoperability starting at regional level. It identifies actions for involvement of EETS Providers and sets out a plan for achieving engagement for EETS implementation delivered at reasonable cost. Recommendations are provided for interoperability management within Bulgaria taking into account the findings of the REETS project (www.reets.eu).

EETS in Bulgaria

Firstly, four key high level questions are considered as follows:

How will EETS Providers be engaged in the process?

Further to the obligations in the EETS Decision it will be important to engage EETS Providers as:

- Heavy vehicle operators may already have toll payment accounts with emerging EETS Providers and therefore it will be convenient to pay tolls in Bulgaria through the same account
- EETS Providers will provide interoperable on-board units which can be used in many countries in the EU
- EETS Providers will provide an efficient and effective way of enabling users to pay tolls and reduce the need to manage customer account payments

The process for engaging EETS Providers can be initiated by providing details of the proposed e-tolling system to known potential EETS Providers. These can extend their service to cover additional member states by engaging local partners or establishing their own customer service networks. Once they are aware of the proposed e-tolling system, they will probably publicize it directly to their customers. They may also choose to market their services more widely within Bulgaria, for example via the Bulgarian road haulage associations.

Therefore, involving potential EETS Providers is as an integral part of launching the e-tolling system. Using their marketing channels and skills will enable effective ongoing public relations and marketing activity.

The Main Steps Required to Introduce EETS Providers:

The first step is to initiate the implementation of the e-tolling system as without a clear decision from government there will be no appetite from EETS Providers to plan to launch their services in Bulgaria. Legislation should clearly define the opportunity for EETS Providers allowing them to assess the market.

Investments are necessary by EETS Providers to set up sales channels within Bulgaria, either establishing a partnership with a local provider or by setting up their own local operation. An EETS Provider must also invest in testing its on-board units and back office interface and processes, and negotiating the service contract.

The European Decision 2009/750/EC obliges Toll Chargers (the Bulgarian Government) to 'accept on a non-discriminatory basis any EETS Provider requesting to provide EETS on the EETS domain(s) under the Toll Charger's responsibility'. This means Government is obliged to offer the same commercial terms to every EETS Provider that meets basic requirements. Therefore, a key step is for Government is to develop a contract and commercial model acceptable for every EETS Provider.

During the REETS project, there has been discussion about what contract terms should be included and what commercial terms would / would not be acceptable. One concern is the level of guarantee required. Therefore, consideration should be given to what level of guarantee will be required by Government from the EETS Provider to provide the necessary guarantee for the tolls handled by the EETS Provider.

Description of Interoperability Management Tasks

Seamless interoperable tolling across road networks with different operators requires management processes and technical standards. Countries and regions which have successfully implemented interoperability have introduced strong mandatory requirements for service provision. In France, ASFA has created the TIS-PL service for heavy vehicles and the Liber-T system for light vehicles. Both are built on a framework of technical standards which all Toll Chargers in France support. Similar requirements exist in Ireland and across Scandinavia (Easy Go).

If multiple Toll Chargers were to exist in Bulgaria (eg for new private roads or concession motorways) then it would be necessary to consider how a framework to achieve national level interoperability could be established.

At the European level, Interoperability Management is also foreseen to ensure that services established in one Member State are compatible with those established in another. The REETS project has identified tasks which should be addressed at European level and these therefore require the active participation of all Member States. REETS has also examined what institutions could be responsible for such tasks at European level, and concluded that existing bodies are best placed i.e. the European Commission Committee on Interoperability of Electronic Toll Collection, the Coordination Group of Notified Bodies, Conciliation Bodies, and standardisation bodies. REETS has identified five broad areas for interoperability management work at European level:

- Contractual aspects
- Legal Framework
- Information Exchange
- Technical Framework
- KPIs

Recommendations for Roles and Responsibilities for Interoperability Management within Bulgaria.

Assuming that there are no roads, bridges or tunnels for which tolls are collected separately and electronically, then there will be only one Toll Charger and a single toll domain within Bulgaria. This means that the interoperability framework at national level can be defined by Government as the sole Toll Charger foreseen as introducing e-tolling in Bulgaria.

This means that Government can define technical and contractual requirements for Service Providers without the consensus formation process required between the multiple Toll Chargers that exist for example in France or Norway. Government is therefore recommended to define the following:

- Contract terms for EETS Providers
- Technical requirements for EETS Providers including suitability for use testing
- Other requirements such as those required by Article 3 of the European Decision 2009/750/EC.

In addition the Ministry, as representative for the Member State, should appoint a conciliation body for Bulgaria in accordance with the requirements of the Decision.

B Interoperability Plan

5.B.1 Background to EETS Market

In 2009, the European Commission issued Decision 2009/750/EC which placed obligations on all stakeholders involved in achieving interoperability of e-tolling systems across the EU. Since then, progress towards European wide interoperability has been slow.

Currently, interoperability only exists in some areas. Spain has made efforts at achieving cross-border interoperability for example, in the Basque and Catalan regions. Scandinavia has created the 'Easy Go' region which includes Norwegian, Danish, Swedish, and now Austrian Toll Chargers. ASFiNAG in Austria has also achieved partial interoperability with Germany although two separate user contracts and invoices are required.

Poland has installed a DSRC infrastructure nationally which complies fully with ISO 15509 and has implemented functionality which allows on-board equipment to be identified.

However, throughout the EU, Service Providers have not been very keen to register as EETS Providers. This is partly due to hesitancy arising from the obligation on EETS Providers to obtain approval in all European toll domains within 24 months of registering. This has been perceived as an unmanageable risk because registration could be potentially withdrawn if this requirement was not achieved.

Two different tolling technologies are allowed by the Directive. This means that EETS on-board equipment must support both GNSS and DSRC tolling. Therefore on-board units which have been introduced being either GNSS or DSRC but not both, are not suitable for EETS. EETS Providers must invest in suitable on-board equipment. Service Providers based in France were in principle planning this as part of the Eco tax system but as this was cancelled they have not been able to establish interoperability in other Member States.

All this uncertainty in the market for EETS Providers resulted in 2013 in the European Commission entering into a contract with 7 member states to co-fund the REETS project. The

broad aim of the project was to remove uncertainties by bringing together Toll Chargers and Service Providers in a low risk environment.

Current/Predicted EETS Providers

Currently, companies are establishing themselves as EETS Providers. These include twelve companies that are members of Aetis, (the Association of Electronic Toll and Interoperable Services) plus Ages EETS GmbH. Ages is the current Service Provider for the EuroVignette and is a Service Provider in the German Toll Collect system. It is also the only company currently registered formally as an EETS Provider with the German government. The twelve members of Aetis are:

- **Axxès SAS.** Provider of electronic toll payment services in France. Axxes issues OBUs with both DSRC and GNSS technologies.
- **DKV EURO SERVICE GmbH + Co.KG.** Pan-European issuer of the DKV fuel card that can be used for toll payments.
- **euroShell Deutschland GmbH & Co. KG.** Pan-European issuer of a fuel card (euroShell Service Card) that can be used for toll payments
- **eurotoll.** Issues and manages subscription contracts for the e-tolling systems for heavy goods vehicles in most European infrastructure and toll road networks.
- **LogPay Transport Services GmbH.** A Service Provider for the heavy goods vehicle Maut system in Germany, and an issuer of fuel / toll service payment cards.
- **OMV.** An issuer of fuel cards for car fleets and truck fleets allowing cashless fuel payment
- **RESSA (Red Espanola de Servicios S.A.).** A pan-European issuer of a fuel card
- **Telepass S.p.A.** An international provider of e-tolling services including on-board unit management.
- **Total Raffinage Marketing S.A.** A Service Provider for heavy vehicles in France, Spain, and Belgium. Also a pan-European issuer of a fuel card (Eurotraffic) that can be used for toll payments.
- **TRAFINEO GmbH.** A fleet card provider and tolling / Value Added Service provider.
- **UNION TANK Eckstein GmbH & Co.KG (UTA).** Issuer of fuel and service cards for commercial goods and passenger transport, and operator of a Europe-wide cashless payment system.
- **W.A.G. payment solutions, a.s.** An independent issuer of fleet cards in Central & Eastern Europe offering sophisticated payment solutions for passenger and freight carriers.

Situation in Neighboring Member States

Note that Member States on trans-European network routes traversing Bulgaria are considered as well as the Member States immediately neighbouring Bulgaria. These include the following:

- **Greece.** There are no EETS domains currently registered for Greece.
- **Romania.** There are currently no EETS domains in Romania.
- **Slovakia.** There is one EETS domain in Slovakia, the heavy vehicle toll system, for which the Toll Charger is NDS (the national highway company). There are currently no EETS Providers registered in Slovakia. However, the operator of Slovakian system has announced its interest in offering toll payment services in other Member States.
- **Czech Republic.** This also has a single EETS domain - the heavy vehicle toll electronic collection system - but does not have any registered EETS Providers. However, a Service Provider based in the Czech Republic, W.A.G. payment solutions a.s., does plan to offer an EETS service. It already offers one payment account for its customers to pay tolls in many European Member States.
- **Poland.** One toll domain exists which is the national heavy vehicle electronic toll collection system. There are currently no EETS Providers in Poland. However, several Service Providers have expressed interest in establishing an EETS service covering Poland.
- **Austria.** Austria has one EETS domain, the heavy vehicle Maut system. There are no EETS Providers registered or offering services in Austria.
- **Germany.** Germany is unique in that there is one EETS Provider registered there, Ages. There is one EETS domain - the LKV Maut system.

Implementation Principles

The national e-tolling system in Bulgaria would be an EETS domain falling under the remit of the Interoperability Directive and the Decision. (Note - this assumes that there are no separate motorway, bridge or tunnel concessions charging separate tolls electronically within Bulgaria. If there were, these would be separate toll domains and national interoperability would also have to be considered).

The Toll Charger for e-tolling (Government) is therefore able to define and implement the contracts between it and EETS Providers without reference to other potential future Toll Chargers in Bulgaria. For example, it is able to establish the remuneration rate that EETS Providers would be paid.

C Member State Responsibilities

Regulatory

The main EU regulations applying to e-tolling systems are:

- Directive 2004/EC/52 on the interoperability of electronic road toll systems
- Decision 2009/750/EC on the definition of the European Electronic Toll Service and its technical elements

All European Member States are required to comply with the Directive 2004/EC/52 by ensuring that operators of national systems offer an e-tolling service that is interoperable with other European services. The European Commission has stated that the purpose of these regulations is:

“To achieve the interoperability of all the electronic road toll systems in the European Union in order to avoid the proliferation of incompatible systems, which may compromise both the smooth operation of the internal market and the achievement of transport policy objectives.”

Tolls applied to heavy vehicles are also regulated by Directive 1999/62/EC for the use of certain infrastructures and later amendments. This Directive reflects the ‘user pays’/‘polluter pays’ principle of internalizing external costs on the environment. There are currently no equivalent Directives applying to the charging of light vehicles. However, the European Union may challenge schemes which contravene articles within overarching European treaties, particularly relating to non-discrimination and personal data protection.

Non-discrimination is a fundamental right within the Charter of Fundamental Rights of the European Union and enshrined in Article 18 of the Treaty on the Functioning of the European Union. The Maastricht treaty on European Union also includes the principle of non-discrimination.

Personal data protection is also a fundamental right within the Charter of Fundamental Rights of the European Union and is enshrined in Article 16 of the Treaty on the Functioning of the European Union. Relevant European legislation includes:

- Directive 95/46/EC on the protection of individuals with regard to the processing of personal data and on the free movement of such data is also relevant to ETC systems.
- Directive 2006/24/EC on the retention of data generated or processed in connection with the provision of publicly available electronic communications services or of public communications networks.

Regarding vehicle categories there are no European regulations that prescribe how toll tariffs are defined in terms of vehicle class, but it should be noted that additional technical complexity will result if European norms are not followed in this area.

Specific Obligations at Member State Level (What Government Must Do)

The following items are listed in decision (2009/750/EC) as being the responsibility of all Member States (rather than Toll Chargers) to enact, so these obligations must be enacted in legislation within Bulgaria.

Article 3. Registration of EETS Providers

The EETS Decision (Decision 2009/750/EC) describes the process of registration of an EETS Provider (Article 3). This is a process under the responsibility of the Member States. According to section (b) of this article, the Member States need to verify that EC-declarations or certificates attesting compliance with the provisions of Annex IV (1) are provided

A process should therefore be defined by Ministry which reflects the requirements a) - f) listed in Article 3 of the Decision and allows EETS Providers to register as such within Bulgaria prior to applying to a Toll Charger to carry out suitability for use tests in a Toll Domain.

Article 10. Conciliation Body

“Each Member State with at least one EETS domain shall designate or establish a Conciliation Body....”

The purpose of a conciliation body is to adjudicate in cases where disputes arise between Toll Chargers and Service Providers. However, conciliation bodies are currently not active in EETS so there is no practical experience of them. One of the tasks of the REETS project was to develop guidelines on the management of interoperability between toll domains and the project will report on this topic at the end of 2015. The Irish government however, has published a set of procedures for the operation of the EETS conciliation process in Ireland. This has been highlighted by the REETS project as an example which could be adopted for the operation of conciliation processes in other countries.

Article 17. Notified Bodies

“Member States shall notify to the Commission and the other Member States any bodies entitled to carry out or supervise the procedure for the assessment of conformity to specifications or suitability for use”

The purpose of notified bodies is to provide a process for the certification of EETS interoperability constituents. EETS interoperability constituents are the technical elements which must be compatible on both Service Provider and Toll Charger side in order to allow correct operation to take place. Specifically this refers to the on-board unit of the Service Provider, roadside DSRC equipment, and the electronic interface between the Service Provider's back office system and the Toll Charger's system.

However, currently available technical standards are not specific enough to allow certification by a notified body to assure operation in any toll domain. The REETS project has been looking at this problem and has recommended a wider process of 'technical accreditation' which would include the specific requirements of individual toll domains.

Article 19. Registers

Each Member State is required to create and publish a register of Toll Domains. Note that the national toll scheme would be considered as a single Toll Domain, whereas roads operated by bodies other than RIA and tolled electronically would be considered as separate Toll Domains.

D Toll Charger Responsibilities

Technical

Having achieved entry into the Register of EETS Providers within a Member State, the EETS Provider has the right to enter into negotiations for providing EETS in any individual toll domain within the EC. The Toll Charger is able to specify in its EETS domain statement, general conditions that an EETS Provider must meet.

Article 5 paragraph 5 of the Decision says *“Toll Chargers shall accept on their EETS domains any operational on-board equipment from EETS Providers with whom they have contractual relationships, which have been certified in accordance with Annex IV.”* Annex IV of the EETS Decision refers to ‘conformity to specifications’ and a list of the applicable technical specifications has been prepared by the co-ordinating group of notified bodies.

The second part of Annex IV refers to suitability for use testing. A procedure for testing the correct operation of the EETS Provider’s on-board equipment, back office interface and business processes in the toll domain should be established by the Toll Charger as part of the implementation of its electronic tolling system.

Organisational

To implement EETS within Bulgaria the following organisational actions are required:

- The Toll Charger (Government), should implement a process for approving prospective EETS Providers and for monitoring their performance once their service is operational.
- During the procurement cycle, information about the scheme should be distributed to potential EETS Providers in order that they may decide whether to prepare an offer of services for Bulgaria. This should be done early enough to allow EETS Providers to complete suitability for use tests prior to offering services in Bulgaria. Government should nominate a conciliation body to carry out mediation between the Toll Charger and Service Providers in the case where approval is disputed.

Commercial

The Toll Charger should prepare general contractual conditions which can be used for contracts with EETS Providers and also with other Service Providers. EETS Providers must be accepted on a non-discriminatory basis. Therefore the terms and conditions offered to EETS Providers should also be non-discriminatory, and payment levels should be comparable if equivalent levels of service are provided by Service Providers. A competition could be used to obtain proposals

from EETS Providers, although it is likely that contracts would need to be entered into with comparable payment levels being given to each Service Provider which is approved.

E EETS Provider Responsibilities

General

The general responsibilities of an EETS Provider concern providing the user with a service to enable tolls to be paid in any toll domain in the EU. This includes providing the user with an on-board unit which complies with technical standards and is accepted by Toll Chargers for use in their toll domains. The EETS Provider must also ensure that the correct vehicle classification information is stored in the on-board equipment and that this does not need to be changed by the user when leaving and entering different toll domains.

EETS Providers are responsible for invoicing users with whom they have contracts, and for maintaining lists of users for whom contracts have been invalidated, for example due to non-payment of invoices.

Compliance with Standards

On-board units issued for EETS services must support both GNSS/CN and DSRC based methods of charging to ensure they are accepted in all other EU Member States. The on-board units must comply with the list of relevant standards for EETS and the on-board unit manufacturer shall have certified the on-board unit in accordance with these requirements prior to the EETS Provider being able to offer services in the toll domain.

Suitability for Use Testing

According to the EETS Decision, EETS Providers must submit their interoperability constituents (i.e. their on-board equipment and back office interface) to the Toll Charger for suitability for use tests. This is generally done after on-board units have already been certified in accordance with relevant European standards. Suitability for use testing allows the Toll Chargers to check that the required functionality has been implemented by the EETS Provider in order to allow correct charging of tolls in the toll domain. The costs of these tests are the responsibility of the EETS Provider and generally involve test driving with a small fleet of equipped vehicles. The Toll Charger must be able to verify that users have been correctly invoiced by the Service Provider for the journeys made by the test fleet.

F Summary

The implementation of EETS is a mandatory EU requirement on government as part of the introduction of an e-tolling system. Bulgaria has administrative obligations as a Member State which are set out above, and these are separate to the obligations on government in its role as Toll Charger for the e-tolling system.

EETS Providers now exist and are in the process of obtaining approvals to offer interoperable services in several other European countries. Heavy vehicles will, within the lifetime of this system, be equipped with EETS compatible on-board units that can be used in Bulgaria, and

many trucks registered in Bulgaria will become EETS customers to use the service in other Member States, even if the service is not available in the short term in Bulgaria.

6 Next Steps

Specific actions to be considered before the next steps in procurement from this part of the deliverable are:

- Choose the body that will undertake enforcement (Police, Customs, RIA, another body such as an SPE.) This needs to be done quickly to avoid delaying the next stages of design. If a new body is set up it can lead on all aspects of tolling operations including enforcement and overseeing Contractor operations.
- Choose which body will commence the procurement
- Consider the changes to legislation identified in this report to support various details of e-tolling and its procurement, and transposition into Bulgarian Law of the EETS Directive and Decision
- Look at the vehicle ownership database and possibilities for access to improve joined up data use and reduce costs for better data sharing in Government. A decision on access to the vehicle registration database will have a direct impact on who operates enforcement - a uniformed public body or a private body

Other key tasks are:

- Prepare contract documents based on the institutional and operational model
- Develop a communications plan with key stakeholders for the project, especially road users and hauliers, so that they can prepare for the changes
- Engage with Bulgarian industry, especially fleet management system providers and local companies able to be Service Providers
- Engage with the international tolling industry, to prepare them for the tender

7 Appendices

Annex A: Data Sharing between the e-tolling/e-vignette System and External Bodies

A.1. Introduction

Deliverable 1 briefly discussed the possibility of bodies such as the Police and Customs using data from the e-tolling / e-vignette system for other, unrelated, purposes. Section 2.5 of this Deliverable 2 briefly discussed how this could be accomplished via a separate data depository and raised the Data Protection implications of such an approach.

This Annex is based on discussions with representatives of the Police and Customs and discusses in more detail how data from the e-tolling / e-vignette system could be used operationally. It should be emphasised that further detailed discussions are required with the services to define the requirements for data sharing. These discussions must take place prior to writing the specifications for the tender for the Contractor - adding in requirements to a system after its implementation is always complex and costly.

A.2. Vehicles of Special Interest (VOSI) - Provision of Near Real Time Detection Data

Frequently Police, Customs or other enforcement or security services are seeking a particular vehicle and wish to be informed of its location when it has been detected.

The e-tolling / e-vignette system can assist in two ways.

Method 1

As set out in sections 2 and 3 of this Deliverable 2, whenever a vehicle passes under an enforcement gantry (or by an MEU), a digital image is made of the vehicle and of its license plate and the vehicle's registration number is read from that digital image. In general, that image and all information related to the vehicle's passage are discarded if the vehicle is not committing an e-tolling or e-vignette offence. However, if the appropriate service (e.g. the Customs Coordination Unit in Sofia) has supplied, in advance, the vehicle registration number of the vehicle of special interest to the Contractor, then the system can be programmed to retain the information regarding the vehicle's passage, including, if required, the digital image of the vehicle, whether or not the vehicle is committing an e-tolling or e-vignette offence. The service that has requested notification of the VOSI can specify whether it is to be notified of the vehicle's passage immediately or within, say 24 hours or a week, and whether the digital image of the vehicle is also passed to the service. The request for notification can last until further notice or be time limited.

The above process applies to all vehicles, whether they have an on-board unit or not. Thus vehicles which only use e-vignettes or route passes, which are exempt from e-tolling or e-vignette obligations or which are evading such obligations can all be detected by this means.

Enforcement gantries are only located at limited points in the road network and MEUs can only cover other parts sporadically. Therefore the above method cannot provide comprehensive coverage.

Method 2

However, those vehicles which are equipped with on-board units (OBUs) for e-tolling purposes can be tracked throughout the network, since they continually send their location data. Each OBU is assigned to a specific vehicle and in principle, that OBU should be used only in that vehicle. Thus by tracking the OBU and assuming that it is being correctly used, the vehicle can be tracked.

As with method 1, the service that has requested notification of the VOSI can specify whether it is notified of the vehicle's passage immediately or within, say 24 hours or a week. No digital image can be requested as this method does not generate such an image. The request for notification can last until further notice or be time limited.

In summary, method 1 can detect all VOSIs but only at limited points in the network, whilst method 2 can only track OBU equipped VOSIs but throughout the whole network. In both cases, it would be possible to pass relevant information to the Customs official at the border point when the vehicle arrives there.

A.3. Access to Data and Images for Traffic Analysis

As described in section 2.5, raw data from the ETC system could be placed in a separate data depository, accessible by services such as Police, Customs Coordination unit, RIA and the security services. The services would then be able to perform their own analyses according to their own requirements, either via tools provided with the data repository or by downloading data to their own systems. The use of a separate data repository is primarily to ensure that access to these data does not have an operational impact on the ETC system. It also allows data in the depository to be anonymised (see below).

An example of the use of such data would be analyses of traffic patterns by Customs to identify trans-shipment points. Data available could include

- OBU location data - dates, times and locations of OBUs (no images would be available)
- Enforcement data - dates, times, locations and number plates of vehicles committing e-tolling and e-vignette violations. While enforcement data include images, it is likely that they would have to be excluded as anonymization requirements (see below) would be negated by the use of images
- VOSI data as discussed in A.2 above

As indicated in section 2.5, care must be taken to ensure that this is done without violating Data Protection requirements. In particular, it is likely that data placed in the depository would need to be anonymised in some way (e.g. number plate ABC123 translated into XYZ245). Such anonymised data is likely to be sufficient for the purpose of traffic pattern analysis, but may not be sufficient for specific operational requirements of the services. A detailed analysis needs to be taken as to the balance between operational requirements and data protection requirements.

Access to the depository and the analyses carried out would need to be tightly controlled and may need to be subject to court orders.

A.4. Oversize Vehicle Checking - Route of Travel

If a vehicle is over-sized or over-weight then on entry to Bulgaria it is charged a fee (irrespective of whether it has an ECMT permit or not) which is dependent on distance to be travelled. Drivers declare on entry where they are travelling and the distance to be travelled. There is clearly a temptation to underdeclare the distance to be travelled to save the fee to be paid. For vehicles with an OBU, it is in principle possible to provide information to Customs officials, on exit from Bulgaria, about the route actually used and therefore distance travelled to make sure that the correct fee had been paid.

As indicated in A.3 above, data in the data repository is likely to be anonymised, which of course would not be useful for this operational purpose. Such vehicle specific data would therefore need to be obtained from the operational system, but as indicated above, without having an impact on the operational ETC system.

One approach would be to implement a variant of the VOSI system described in A.2 above, whereby Customs at entry requests that all distance data for a vehicle in question be accumulated until further notice and on entry requests that accumulated distance data, at the same time terminating the accumulation request.

For vehicles without OBUs, information obtained by the ETC enforcement system can be provided, to check whether this is consistent with the declared route/distance.

A.5. Risk Analysis by Customs for Detailed Customs Checks

Part of the risk analysis undertaken by Customs at the border of whether an individual vehicle should be subject to detailed Customs checks is the route travelled. This is normally obtained from the TIR / T1 document or exit summary declaration. However, it could potentially be supplied from the ETC system (in detail for vehicles for OBUs, or assumed for vehicles with transit route passes, or any information obtained by the ETC enforcement system for vehicles without OBUs or route passes) as discussed in A.4 above.

A.6. Auto Checking of Emissions Class for ECMT Permits at Customs Check Points

The ECMT permit requires that the emissions class be Euro III or better. At present this is checked by checking the vehicle's registration documents. For vehicles with OBUs, the emissions class will be recorded in the OBU. For vehicles with OBUs which have a DSRC element, the emissions class could be automatically checked. This assumes that the vehicle registration and OBU programming process was rigorous and the data in the OBU are correct. Not all vehicles could be checked in this way but this would provide some improvement in overall efficiency. This approach does not require access to the depository of ETC data nor to the ETC operational system, but would require DSRC readers to be installed at Customs posts and linked to the Customs system. This would require the secure distribution of encryption keys to Customs to enable these DSRC readers to read the OBUs.

A.7. Sale of ETC Route Passes/vignettes by Customs

As discussed in Section 2.3.1, the proposed e-tolling / e-vignette system requires the sale of route passes and e-vignettes. Since Customs currently sells paper vignettes at entry and exit points, it would be a logical development of current practice to involve Customs in the sale of route passes and e-vignettes on entry. No sales would be made at exit, since any vehicles without OBUs, route passes or e-vignettes would be subject to normal enforcement procedures, which would not involve Customs. It would not be practical to distribute OBUs at the booth as the process is more complex and requires the installation of an OBU.

The sale of route passes and e-vignettes by Customs would require modification of the existing road fees and permits module of the Customs IT system and in particular would require real-time links to the ETC system so that sales could be immediately recorded, so that such vehicles would not be subject to enforcement action. As with other aspects of interaction between the ETC system and external agencies, this would require detailed specification and agreement

Annex B: Legal Changes

B.1. Description of the Identified Legal Amendments Necessary for the Implementation of the E-vignette and Toll System in Bulgaria

1. AMENDMENTS IN ROADS ACT AND ROADS TRAFFIC ACT

| Act/Provision | Current Provision | Reasons | Suggested Approach |
|------------------|--|---|---|
| Roads Act | | | |
| Art. 10 | For passage on national roads that are included in the Transeuropean Road Network as well as roads outside the latter or on their sections the Council of Ministers may levy only one of the following tolls: 1. Toll; Vignette | This provision is the legal basis for the collection of fees for using of road infrastructure. The amendment is necessary because of the implementation of a completely new e-vignette and toll system. | <p>The new reading of the text may be: Art. 10 (1) for passage along republican roads, which are included in the Trans-European road network, as well as those that are outside of it or sections thereof, the Council of Ministers may introduce only one of the following fees for a given category of vehicle: (1) Fee for the use of the road infrastructure - vignette fee; (2) Fee for distance travelled - Toll.</p> <p>A new paragraph may be added to art. 10 in the sense that: The conditions and rules for the operation of the vignette and toll system shall be regulated in an ordinance of the Council of Ministers in conformity to the requirements of Directive 1999/62/EC, Directive 2004/52/EC and Decision 2009/750/EC.</p> |
| Art. 10a | The provision explains in detail the vignette fee payment process. | The amendment /revocation is necessary because of the implementation of a completely new e-vignette and toll systems. The entire article, including its 13 paragraph, need to be amended. | A possible approach is to revoke the provision and regulate the details in the ordinance of the Council of Ministers under article 10. |
| Art. 10g | The provision states that for vehicles registered in a foreign country a vignette fees shall not be collected in case this is stipulated in an international agreement or convention. | Only synchronization is needed. The amendment is necessary in order to clarify that the rules applies both to vignette and toll fees. | |

| Act/Provision | Current Provision | Reasons | Suggested Approach |
|---------------------|---|--|--------------------|
| Art. 10d | The provision states that vignette fees are not applicable for tractors, tractors' trailers and other vehicles used in agriculture. | Only synchronization is needed. This text should be considered only in order to include that vignette and toll fees are not applicable to those vehicles. | |
| Art. 10e (1) | The provision states that the control on border control points of the obligation to pay the fees under art. 10 RA shall be effectuated by the officer of the Customs Agency | Only synchronization is needed. This provision should be synchronized with the amendments under art. 10. | |
| Art. 10e (2) | This provision specifies that in case a vehicle intends to leave the country and it does not holds a valid vignette sticker, it can leave the country only after having paid the corresponding under art. 10a (7) fee to the specialized unit of the Customs Agency. | Only synchronization is needed. This provision should be synchronized with the amendments under art. 10 and may refer for details to the ordinance adopted by the Council of Ministers under art. 10. | |
| Art. 10 g | With regards to a vehicle used for combined transport within the meaning of Article 56 of the Railroad Transport Act no vignette toll shall be paid for its movement from the border to the nearest intermodal terminal and vice versa, if a certificate of combined internal transport on the territory of the Republic of Bulgaria has been issued according to standard form approved by the Minister of Transport, Information Technology and Communications. | Only synchronization is needed by adding the corresponding wording, i.e. including toll fee. | |
| Art 19. | <p>(1) Roads shall be managed as follows:</p> <p>1.National roads: by the Road Infrastructure Agency and by the Strategic Infrastructure Projects National Company in the cases, provided for by this Act;</p> | <p>In case a new stated owned company is created to management the e-vignette and toll system it will be precise to add the company in this provision as follows:</p> <p>(1) Roads shall be managed as follows:</p> <p>1. National roads: by the Road Infrastructure Agency and by the Strategic Infrastructure Projects National Company and (new Toll Company) in the cases, provided for by this Act;</p> | |

| Act/Provision | Current Provision | Reasons | Suggested Approach |
|-----------------|--|--|--------------------|
| Art. 30 | <p>(1) The Agency shall pursue the activities pertaining to the construction, repair and maintenance of the national roads.</p> <p>(2) The Strategic Infrastructure Projects National Company shall perform the activities related to the construction, repair and maintenance of the highways under Article 28b, Paragraph 1.</p> | In case a new stated owned company is created to management the e-vignette and toll system it should be added in a new paragraph 3 and the rest of paragraph shall be renumbered. | |
| Art. 44b | <p>The provisions reads:</p> <p>(1) The revenues collected from vignette tolls under this Act shall be registered as revenues of the budget of the Agency. ... (3) The vignette-toll revenues under Article 44, Paragraph 1, Item 2 shall not be used to finance new road infrastructure construction.</p> | <p>This articles need to be revoked and a new one adopted regulating the budgetary aspects of the collection of the fees under the new system.</p> <p>There are two suggested approaches:</p> <ul style="list-style-type: none"> • To amend both paragraphs giving the possibilities for RIA to decide with certain limits on the destination of the revenues from toll fees, including the possibility to finance new road infrastructure. • To revoke the provision and regulate the matter in a separate new chapter which treats the creation of a state owned company - as indicated below. <p>EU Law</p> <p>The new provision need to be aligned with the provision of Art. 9, paragraph 2. Directive 1999/62/EC which states that “Member States shall determine the use of revenues generated by this Directive. To enable the transport network to be developed as a whole, revenues generated from infrastructure and external costs charges, or the equivalent in financial value of these revenues, should be used to benefit the transport sector, and optimise the entire transport system. In particular, revenues generated from external cost charges, or the equivalent in financial value of these revenues, should be used to make transport more sustainable, including one or more of the following:</p> <p>(a) facilitating efficient pricing;</p> <p>(b) reducing road transport pollution at source;</p> <p>(c) mitigating the effects of road transport pollution at source;</p> <p>(d) improving the CO 2 and energy performance of vehicles;</p> | |

| Act/Provision | Current Provision | Reasons | Suggested Approach |
|---|--|---|---|
| | | (e) developing alternative infrastructure for transport users and/or expanding current capacity; (f) supporting the trans-European transport network; (g) optimising logistics; (h) improving road safety; and (i) providing secure parking places. This paragraph shall be deemed to be applied by Member States, if they have in place and implement fiscal and financial support policies which leverage financial support to the trans-European network and which have an equivalent value of at least 15 % of the revenues generated from infrastructure and external cost charges in each Member State.” | |
| Art. 44c | (1) The budget of the Agency shall plan for and cover spending for financing activities pertaining to the operation, maintenance, repair, and reconstruction of the national roads which are subject to vignette tolls that shall include: ... | This provision need to be synchronized with the new institutional model. It may regulate the possibility to finance new construction according to which the revenues from toll and e-vignette fee may be used for construction of new roads within certain limits observing the provision of the Law on Public Finance and the Annual Law on State Budget. The same comment as to art. 44b applies. | |
| <p>This chapter can be situated after chapter 4 “b” - Strategic Infrastructure Projects National Company).</p> <p>In case a new stated owned company is created to manage the E-vignette and Toll system the new chapter and provision may follow the structure of the preceding chapter regarding the Strategic Infrastructure Project National Company.</p> <p>In addition the provisions should include: financing of the company may and the essential terms of the contract between Toll Charger and Toll Operator. The essential terms may be part of the ordinance under art. 10 and only a reference to be made to that provision.</p> <p>While the collection of fees shall be made by the state company, including via the toll operators, the imposition and collection of fines can be left to the RIA. In view of the above the current legal framework as to the control, imposition and collection of sanctions will not require substantive amendments (except for the amendments related to the electronic control and imposition of sanctions, as mentioned below in the third section of this working document).</p> | | | |
| Roads Traffic Act | | | |
| Art. 100 (2) | The motor vehicle driver shall adhere a valid vignette sticker for a paid vignette fee, pursuant to Article 10, Paragraph 1, item 1 of the Roads Act, in the lower right corner of the windshield of the motor vehicle, when driving on the national roads and shall | This provision will be no longer applicable. Therefore the text should be amended taking into account the obligations according to the Roads Act. It is important to clearly | A possible amendment reads as follows: The motor vehicle driver shall carry a valid document proving the payment of the corresponding to that vehicle vignette or toll fee in conformity with the requirement of the ordinance under art. 10 of the |

| Act/Provision | Current Provision | Reasons | Suggested Approach |
|--|--|---|--|
| | remove the vignette sticker immediately after the expiry of its validity. | differentiate the obligation to pay a vignette and toll fee under the Roads Act and the obligation to use (be on the road) the road infrastructure after paying the corresponding toll or vignette fee and holding the corresponding prove - receipt, a properly installed and programmed on board unit, a route pass, etc. - for the purposes a reference to the ordinance under art. 10 of the Road Act may be given. | Roads Act. |
| Art. 139 (5) | Driving the vehicles set forth in the Roads Act on national roads shall be allowed after paying a vignette fee under the procedure of Article 10, Paragraph 1, Item 1 of the Roads Act. | Only synchronization is needed. | Driving the vehicles set forth in the Roads Act on national roads shall be allowed after paying the corresponding toll or vignette fee under the Roads Act. |
| Chapter 5 (Rights and Obligations of the Control Authorities) - art. 165 (1), p. 11 | (1) Authorities designated by the Minister of Interior: ... 11. control whether drivers observe their obligation to drive the vehicles on the national roads after paying a vignette fee, placing valid vignette stickers, and removing vignette stickers with expired terms; | Only synchronization is needed. | (1) Authorities designated by the Minister of Interior: ... 11. control whether drivers observe their obligation to drive the vehicles on the national roads after paying a vignette or toll fee; |
| Chapter 6 (Administrative measures of compulsion) | | | |
| Art. 171 , p. 2, letter "g" | In order to ensure road traffic safety and put an end to the administrative violations, the following administrative measures of compulsion shall be enforced: ...2. temporary prohibition of using of a vehicle: ... g) when the respective vignette fee referred to in Article 10, Paragraph 1, Item 1 of the Roads Act has not been paid, or when an invalid vignette sticker has | Only synchronization is needed by adding the corresponding wording, i.e. including toll fee. | In order to ensure road traffic safety and put an end to the administrative violations, the following administrative measures of compulsion shall be enforced: ...2. temporary prohibition of using of a vehicle: ... g) when the respective vignette fee or toll fee under the Roads Act has not been paid, or has not been paid correctly; |

| Act/Provision | Current Provision | Reasons | Suggested Approach |
|---------------------|---|--|--------------------|
| | been stuck; | | |
| Art. 179 (3) | Article 179. (1) A driver driving a vehicle on national roads without having paid the vignette fee under Article 10, Paragraph 1, item 1 of the Roads Act, or driving a vehicle with an affixed vignette sticker with graphic design, differing from the approved one, shall be fined as follows: ... | An amendment of this provision is needed. The text depends on the technical solution put in place and the possibilities for the driver to prove payment. | |
| Art. 179 (4) | (4) A driver driving a vehicle on national roads for which the vignette fee under Article 10, Paragraph 1, item 1 of the Roads Act has been paid in amount, lower than the statutory amount for the respective category, shall be fined as follows: ... | A substantive amendments of this provision is needed and synchronization with article 179 (3). | |

B.2. Revocation and Adoption on New Implementing Provisions - Regulations and Ordinances

The specifics of the new system can be regulated in an ordinance which will substitute the current Ordinance on conditions and procedures for the collection of fees for the use of road infrastructure, distance travelled, use of separate facilities on republican roads and for special use of republican roads or parts thereof.

Art. 10 of the Roads Act can be the legal base for adoption of such ordinance by the Council of Ministers as pointed above.

In the second column a reference to the relevant EU law is made. The information may be used for the substantiation of the amendments according to national procedure for adoption of legal acts.

The ordinance would regulate the following aspects:

| Structure of the Ordinance | Relevant provision for the analysis for correspondence with EU Law |
|---|--|
| 1. General Part - Obligation to pay a fee for use of the road infrastructure | <ul style="list-style-type: none"> Directive 1999/62/EC <p><i>Article 7, p. 1</i> - Without prejudice to Article 9 paragraph 1a, Member States may maintain or introduce tolls and/or user charges on the trans-European road network or on certain sections of that network, and on any other additional sections of their network of motorways which are not part of the trans-European road network under the conditions laid down in</p> |

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| | <p>paragraphs 2, 3, 4 and 5 of this Article and in Articles 7a to 7k. This shall be without prejudice to the right of Member States, in compliance with the Treaty on the Functioning of the European Union, to apply tolls and/or user charges on other roads, provided that the imposition of tolls and/or user charges on such other roads does not discriminate against international traffic and does not result in the distortion of competition between operators.</p> <p>2. Member States shall not impose both tolls and user charges on any given category of vehicle for the use of a single road section. However, a Member State which imposes a user charge on its network may also impose tolls for the use of bridges, tunnels and mountain passes.</p> <p>(...)</p> <ul style="list-style-type: none"> • Directive 2004/52/EC and Decision 2009/750/EC <p>The Directive and the Decision lay down the conditions necessary to ensure the interoperability of electronic road toll systems in the Community. It applies to the electronic collection of all types of road fees, on the entire Community road network, urban and interurban, motorways, major and minor roads, and various structures such as tunnels, bridges and ferries.</p> <p>The prospective ordinance should be completely synchronized with these acts.</p> |
| 2. Classification of the vehicles | <p>According to art. 2, letter “f” from the Directive 1999/62/EC ‘type of vehicle’ means a category into which a vehicle falls according to the number of its axles, its dimensions or weight, or other vehicle classification factors reflecting road damage, e.g. the road damage classification system set out in Annex IV, provided that the classification system used is based on vehicle characteristics which either appear in the vehicle documentation used in all Member States or are visually apparent</p> |
| 3. Covered roads infrastructure - description (may be in annex to the ordinance) - motorways, first-class roads, class 2 and class 3 roads. Signalling the road infrastructure | <p>According to art. 2, letter “a” from the Directive 1999/62/EC ‘trans-European road network’ means the road network defined in Section 2 of Annex I to Decision No 1692/96/EC of the European Parliament and of the Council of 23 July 1996 on Community guidelines for the development of the trans-European transport network as illustrated by maps. The maps refer to the corresponding sections mentioned in the operative part of and/or in Annex II to that Decision</p> |
| 4. E-Vignettes. Calculation of the due amount and payment methods. Validation of the payment and right | <p>The vignette will fall under the definition of ‘user charge’ according to art. 2, letter “c” from the Directive 1999/62/EC. The definition is a “specified amount payment of which confers the right for a vehicle to use for a given period the</p> |

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| for use of infrastructure | infrastructures referred to in Article 7(1)” |
| 5. Tolls. Calculation of the due amount and payment methods. Validation of the payment and right for use of infrastructure. | According to art. 2, letter “c” of Directive 1999/62/EC ‘toll’ means a specified amount payable for a vehicle based on the distance travelled on a given infrastructure and on the type of the vehicle comprising an infrastructure charge and/or an external-cost charge; |
| 5.1. Obligation for installation of on-board equipment. | Annex III to the Directive 1999/62/EC sets the core principles for the calculation of the tolls. The technical elements which should be observed are given in Decision 2009/750/EC of 6 October 2009 on the definition of the European electronic toll service and its technical elements adopted under Directive 2004/52/EC of the European Parliament and of the Council of 29 April 2004 on the interoperability of electronic road toll systems in the Community. |
| 5.2. Obligation for correctly setting up of the on-board equipment | |
| 5.3. Validation of the payment and right for use of infrastructure | |
| 6. Route passes | Article 7j, p. Directive 1999/62/EC states that “2. The arrangements for collecting tolls and user charges shall not, financially or otherwise, place non-regular users of the road network at an unjustified disadvantage. In particular, where a Member State collects tolls or user charges exclusively by means of a system that requires the use of a vehicle on-board unit, it shall ensure that appropriate on-board units compliant with the requirements of Directive 2004/52/EC of the European Parliament and of the Council of 29 April 2004 on the interoperability of electronic road toll systems in the Community can be obtained by all users under reasonable administrative and economic arrangements” |
| 7. Replacements related to the e-vignette and tolls equipment and payments | |
| 8. Competence of Roads Infrastructure Agency and the State owned company managing the (a legal base in the Roads Act will be required) | The definitions shall be aligned with the definitions from Decision 2009/750/EC - Article 2. |
| 9. Definitions of Toll Administrator (if applicable), Toll Charger, Service providers. Obligation of the Toll Charger and EETS service providers. | |
| 9.1. Competences of the Toll Charger and the Service Provider | Article 5 and Article 4 of Decision 2009/750/EC. |
| 9.2. EETS Domain Statement - rules. According to the EETS Decision every Toll Charger has to prepare and publish an EETS Domain Statement, in which he | Annex I to Decision 2009/750/EC gives the contents of an EETS Domain Statement. |

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| <p>describes the general conditions for acceptance of an EETS Provider in his Toll Domain - the texts should regulate this aspect as well</p> | |
| <p>10. Registration process for EETS Providers, including technical and financial conditions. Competent bodies (a legal base in the Roads Act will be required)</p> | <p>Article 3 (4) of Directive 2004/52/EC provides that Member states having electronic road toll systems shall ensure that operators and/or issuers offer the European electronic toll service to their customers within the specified terms. And Article 3 of the Decision provides that EETS Providers shall seek registration in a Member State where they are established, which shall be granted if they fulfil the requirements that are specified there.</p> <p>Article 19 of the Decision states that:</p> <p>1. For the purposes of the implementation of this Decision, each Member State shall keep a national electronic register of the following:</p> <p>(a) the EETS domains within their territory, including information relating to:</p> <p>(...)</p> <p>(b) the EETS Providers to whom it has granted registration according to Article 3.</p> <p>(...)</p> |
| <p>11. Conciliation Body</p> | <p>Under Chapter III of Decision of 6 October 2009 on the definition of the European electronic toll service and its technical elements</p> |
| <p>12. Exemption from e-vignette and toll fees</p> | |
| <p>13. Control - with possible cross references with other ordinance as for instance Ordinance for the Conditions and Procedure for Control by Electronic Means of Rules for Use of Roads and rules on access to databases by the Toll Charger - vehicle registration database, civil insurance liability database.</p> | <p><i>Article 9a of Directive 1999/62/EC states that “Member States shall establish appropriate controls and determine the system of penalties applicable to infringements of the national provisions adopted under this Directive. They shall take all necessary measures to ensure that they are implemented. The penalties established shall be effective, proportionate and dissuasive.”</i></p> |
| <p>14. Sanctions (a legal base in the Roads Act will be required)</p> | |

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| 14.1. Breach of the obligation for installation of on-board equipment | |
| 14.2. Breach of the obligation of correct set-up of the on-board equipment assuring the correct fee is collected | |
| 14.3. Other breaches | |
| 15. Provisional provisions - regulating the transitional period for implementation | |

B.3.Synchronization with Other Acts

| Act/Provision | Suggested Approach |
|--|---|
| Regulation for Application of the Roads Acts | <p>The vignette fee is mentioned in several provisions which need to be synchronized.</p> <p>In addition, art. 64 stipulate that RIA is a first level credit spending unit to the Council of Ministers. Paragraph 2 of this provision states that the funding source of RIA are “1. Subsidies and transfers from the state budget defined in the Law on the Budget for the respective year; 2. Taxes charged under art. 10 and art. 18, parra 3, p 1 for the Roads Act...”. Paragraph 3 states that the funds shall be spent for “1. Construction of new road infrastructure, 2. Exploitation, maintenance, repair and reconstruction of the republican roads ...”.</p> <p>This provision may not need to be amended but should be synchronized with art. 44b para. 3 of the Roads Act which states that revenues from vignette fees cannot be used to finance the construction of new road infrastructure.</p> |
| Ordinance № 81213-532 / 12.05.2015 on the conditions and order for use of electronic technical means and systems for control over the obligation for circulation of the roads | <p>The ordinance regulating the use of technical means and systems for the control over the obligation related to the use of road, including using cameras for ascertainment of an infringement and imposing electronic fines.</p> <p>The additions to this Ordinance should give a detailed explanation of the technical means for the use of such means for the purposes of control of the obligation to pay an e-vignette or a toll fee.</p> <p>However, the changes related to this may be introduced in another ordinance, including the ordinances under art. 10. In case of adoption of another ordinance it should be very well synchronized with this one in order to avoid collision of provisions and misinterpretations.</p> |

| Act/Provision | Suggested Approach |
|--|--|
| Ordinance № H-19 of December 2, 2008 on the conditions and procedures for the release of persons with 50 per cent and over reduced work capacity or type and extent of disability, and individuals or families raising children with disabilities up to 18 years of age and until the completion of secondary education, but not later than 20 years of age, from the obligation to purchase vignette for the use of republican roads. | Only synchronization is needed. |
| Ordinance № H-20 of December 15, 2008 on the conditions and procedures for the compensation of the value of the free vignettes, received by persons with 50 per cent and over reduced work capacity or type and extent of disability, and individuals or families raising children with disabilities up to 18 years of age and until the completion of secondary education, but not later than 20 years of age, released from the obligation to purchase vignette for the use of republican roads | |
| Ordinance for the border controlling points adopted by decision of the Council of ministers number № 104/20.05.2002 | <p>The Ordinance covers the organization, activity and management of the state border controlling points situated in the internal and external borders and the coordination between the border control bodies in Bulgaria.</p> <p>The Ordinance includes provisions regulating the control of the vignette fee obligation.</p> <p>Synchronization is needed.</p> |

B.4. Substantiation of the Amendments - Analysis for Correspondence with EU Legal Framework

According to Art. 28 of the Law on Normative Acts, the draft of the bill for amendment should be accompanied with substantiation for its adoption. The report containing the substantiation shall include:

- The reasons for the adoption of the amendments
- The aims which those amendment pursue

- The financial and other resources which will be necessary for the implementation of the new framework and analysis of the correspondence of the new provisions with European Union Law.

The Analysis of the correspondence of the new provisions with European Union Law is of utmost importance since the new provisions are closely linked to Directive 1999/62/EC, Directive 2004/52/EC and Decision 2009/750/EC.

Both Directive 1999/62/EC (Article 12), Directive 2004/52/EC (Article 6) state that when Member States implement the Directives the national measures shall contain a reference to the directives. This obligation may be observed in case the suggestion to include a reference in art. 10 of the Roads Act is accepted and additional reference is made in the ordinance discussed above.

B.5. Communication to the European Commission

The State shall have the following obligations for communication to the EU Commission related to the implementation of a new E-vignette and Toll system in Bulgaria.

5.1 Under Directive 1999/62/EC:

- Member States shall communicate to the Commission the text of the main provisions of domestic law which they adopt in the field covered by the Directive. The Commission shall inform the other Member States thereof. (**Article 12**).
- Every four years after 16 October 2014 Member States which levy an external-cost charge and/or an infrastructure charge shall draw up a report on tolls, including concession tolls, levied on their territory and shall forward it to the Commission which shall make it available to the other Member States.
- At least six months before the implementation of a new infrastructure charge tolling arrangement, Member States shall send to the Commission:
 - (a) for tolling arrangements other than those involving concession tolls:
 - (i) the unit values and other parameters used in calculating the various infrastructure cost elements, and
 - (ii) clear information on the vehicles covered by the tolling arrangements, the geographic extent of the network, or part of the network, used for each cost calculation, and the percentage of costs that are intended to be recovered;
 - (b) for tolling arrangements involving concession tolls:
 - (i) the concession contracts or significant changes to such contracts,
 - (ii) the base case on which the grantor has founded the notice of concession, as referred to in Annex VII B to Directive 2004/18/EC of the European Parliament

and of the Council of 31 March 2004 on the coordination of procedures for the award of public works contracts, public supply contracts and public service contracts; this base case shall include the estimated costs as defined in Article 7b(1) envisaged under the concession, the forecast traffic, broken down by type of vehicle, the levels of toll envisaged and the geographic extent of the network covered by the concession contract.

- Within six months of receiving all the necessary information in accordance with paragraph 1, the Commission shall give an opinion as to whether the obligations of Article 7e are complied with. The opinions of the Commission shall be made available to the Committee referred to in Article 9c.

5.2. Under Directive 2004/52/EC

Member States shall immediately forward to the Commission the provisions, implementing the directive with a table correlating those provisions with the Directive.

Annex C: Enforcement of Foreign Vehicles

C.1. Introduction

Section 2.4 of the main body of this Deliverable sets out the proposed enforcement concept. This is intended to be similar to the process used by the Police for enforcement of speeding offences and has the key advantage of not requiring the stopping of vehicles at the roadside (except for limited defined cases), thereby improving the efficiency of enforcement and not needing to involve Customs in the enforcement of e-tolling and e-vignettes (as opposed to the sale of route passes and e-vignettes).

However, detailed information has not been received from the Police regarding the agreements in place governing their cooperation with foreign enforcement bodies in respect of enforcement of foreign vehicles. It is therefore not possible to say with certainty whether such agreements can be adapted for the enforcement of e-tolling and e-vignettes with respect of foreign vehicles. This annex therefore discusses the issues surrounding the enforcement of foreign vehicles and the options available if the proposed enforcement concept is not possible for foreign vehicles.

Enforcement of foreign vehicles is a problem for all countries with freeflow e-tolling and e-vignette systems so this draws on experience in other countries.

C.2. Rationale for proposed enforcement and potential issues

C.2.1 Overview

There are three key stages in the enforcement process:

- Establishing that an offence has occurred and which offence that is
- Establishing the owner of the vehicle to whom the penalty should be sent
- Ensuring that the penalty is paid

Establishing that an offence has occurred and which offence that is, often requires access to the relevant vehicle registration database, to establish the class of vehicle. For example, the enforcement system can easily detect that a vehicle has no on-board unit, has not purchased a route pass and has not purchased an e-vignette. It therefore has no means of payment of e-tolls / e-vignette and is therefore likely to be committing an offence. However, it may be that the vehicle is exempt, by virtue of its ownership, or by its vehicle type (e.g. vehicle specially adapted for carried of disabled people) and is therefore not actually committing an offence. This can only be established by accessing the appropriate vehicle registration database.

Similarly, it is likely that a vehicle with no means of payment under 3.5 tonnes will be committing a different offence (not complying with e-vignette obligations) from a vehicle over 3.5 tonnes (not complying with e-tolling obligations) and we assume that the penalties for these different offences will be different. Thus establishing whether a vehicle is under or over 3.5 tonnes is a critical step under the Administrative Violations and Sanctions in issuing a penalty. In clear-cut cases, the enforcement system will be able to establish this, but where the vehicle is near the 3.5 tonnes boundary, the measurement systems are not precise enough to identify the

weight of the vehicle so establishing this requires access to the appropriate vehicle registration database.

Access to the vehicle registration database is also required to identify the owner of the vehicle to which the penalty should be addressed.

Access to vehicle registration databases in other countries would enable the enforcement body to confirm that an offence has in fact been committed, which offence that is and to whom the penalty should be sent. However, although the enforcement body is thus in a position to send out a penalty, it cannot of course enforce it in a foreign country. The enforcement concept therefore envisages that if the penalty is not paid, it is sent to the enforcement body in that country for enforcement.

C 2.2 Potential Issues

Under the proposed enforcement concept, vehicle registration databases in other countries would be accessed via the EUCARIS system, which is used by the Police for enforcement of speeding offences. The use of EUCARIS is governed by European Directive EU/2015/413, which lists the offences for which countries must provide mutual access to each other's vehicle registration databases. That list does not include e-tolling or e-vignette offences. Thus other countries cannot be forced to give Bulgaria access to their databases for the purposes of e-tolling or e-vignette enforcement.

However, there is nothing in the Directive which prohibits the use of EUCARIS for such purposes, provided that Bulgaria has an appropriate bi-lateral agreement with that country. It is understood that Bulgaria has such bi-lateral agreements (which precede in time Directive EU/2015/413) in place with a number of countries in relation to speeding offences and it is envisaged that these would be extended to cover e-tolling and e-vignette offences. However, as detailed information has not been received from the Police regarding such agreements, it is therefore not possible to say with certainty whether such extension would be possible.

Similarly, it is not possible to say whether the bi-lateral agreements relating to enforcement of issued penalties could be extended.

C.3 Options for Foreign Vehicle Enforcement

C.3.1 Introduction

The options presented in this section are not mutually exclusive. All would require some legal amendments not considered in Section 4 of the main Deliverable and would require further development with the bodies involved. The choice depends on the ability to use EUCARIS.

C.3.2 The Use of a European Debt Recovery Agency (EDRA)

Many foreign toll roads, e.g. UK, Ireland, Norway, and France use an European Debt Recovery Agency (EDRA) to pursue foreign unpaid tolls. In the case the toll is seen as a civil debt in the country of origin of the vehicle. The EDRA has access to the owner details for that country and is paid a fixed fee for recovery, or a % of the sums recovered.

This is useful for large scale evasion e.g. by regular heavy vehicle users, as the debt collection would be easier with a corporate body. It is also useful for regular foreign evaders (e.g. cars registered abroad that travel a great deal inside Bulgaria).

There are three variations.

EDRA Used for Enforcement Only

If the bilateral agreements referred to above can be extended to cover the use of EUCARIS but not the use of foreign enforcement agencies, then an EDRA could be used in place of foreign enforcement agencies. The sequence would then be:

- Enforcement agency uses EUCARIS to obtain vehicle class details and ownership details to establish offence and owner
- Enforcement agency sends penalty to vehicle owner
- If vehicle owner does not pay penalty, enforcement agency sends penalty to EDRA for enforcement, either directly or via National Revenue Agency (NRA)

EDRA Used to Obtain Vehicle Details and for Enforcement

If the bilateral agreements referred to above cannot be extended to cover either the use of EUCARIS or the use of foreign enforcement agencies, then an EDRA could be used in a two stage process as follows:

- Enforcement agency uses EDRA to obtain vehicle class details and ownership details to establish offence and owner
- In accordance with AVSA, enforcement agency sends penalty to vehicle owner
- If vehicle owner does not pay penalty, enforcement agency sends penalty to EDRA for enforcement, either directly or via National Revenue Agency (NRA)

Alternatively, the penalty could be sent to the EDRA straightaway, instead of to the vehicle owner first. However, it would be necessary to establish whether that would be in accordance with the requirements of AVSA.

EDRA Used for Full Enforcement

If the bilateral agreements cannot be extended to cover either the use of EUCARIS or the use of foreign enforcement agencies, then it is possible to use an EDRA in a single stage process as follows:

- Enforcement agency issues multiple penalties to cover all possible cases (e.g. one penalty for an e-tolling violation and one penalty for an e-vignette violation if the enforcement system cannot establish with certainty which applies) and sends them to the EDRA

- The EDRA accesses the relevant vehicle registration database to establish the correct penalty and the vehicle owner
- The EDRA informs the enforcement agency about penalties which should be cancelled
- The EDRA sends the correct penalty to the vehicle owner and collects the penalty

It is not clear whether this variation would be in accordance with the requirements of AVSA. However, it is used extensively already in Europe.

C.3.3 The Use of MEUs to Stop Foreign Vehicles

MEUs could be used, as in other countries (e.g. Poland) to stop vehicles at the roadside to confirm whether an offence is being committed, which offence and to issue a penalty which is immediately payable (or to collect a deposit of the value of the penalty which is refundable if the penalty is not eventually issued).

The MEU could issue penalties both for offences detected at the time of stopping of the vehicle or for offences by that vehicle which have been previously detected by stationary enforcement gantries but for which a penalty has not yet been issued or paid.

The disadvantages of this approach are that:

- It can only capture a small percentage of evading vehicles
- Since MEUs must be manned by uniformed officers with the power to stop vehicles, it increases the cost of operating MEUs
- When an MEU has stopped a vehicle, it may not be physically positioned to act as a moveable enforcement gantry to detect offences of other vehicles (its primary duty), thus lowering the operational efficiency of MEUs
- It runs counter to the trend in Bulgaria of not collecting penalties at the roadside

C.3.4 Penalising by Customs on Exit of Violators of e-tolling and e-vignette Violations

When a foreign vehicle comes to the checkpoint, the Customs operator would be informed that there are potential e-tolling or e-vignette violations for which penalties have not been issued. On the basis of information provided by the enforcement system and vehicle documentation provided by the driver, Customs investigates whether an offence was actually committed, issues the appropriate penalties, and collects payment for these penalties.

Such an approach requires the agreement of Customs, a linkage between the ETC and Customs systems and enhancement of the Customs IT system to generate a penalty based on the data received from the ETC system. For such a process to be viable, without blocking a lane, the penalty must be immediately payable, without the driver having the possibility of disputing the penalty on the spot - later appeals would of course be possible. This approach may require

changes in the law. It should be noted that Customs have stated that they would only be interested in a process which has this level of simplicity.

If such an approach is not consistent with AVSA, then it may be necessary to direct the vehicle to a holding area for separate processing and issuing of a penalty rather than blocking a lane.

Annex D: Preceding Analytical Work

D.1.Approach for Narrowing the Number of Options

There are numerous options that may be considered based on:

- Vignette, e-vignette or e-tolling for each vehicle type
- 4 possible road levels (from motorways down, to motorways plus roads class 3)
- 2 different technologies (GNSS or DSRC)

A solution was sought from these that could be delivered:

- To meet the target for collecting additional revenues of at least BGN 400 million per annum
- Without risk of delay and loss of early revenue - 2017/18, if possible
- Without politically unacceptable increase in travel costs for users, especially for light vehicles
- Fairly - so that the polluter, or heavy user pays
- In line with other policies and social and economic factors, and other data needs.

In addition, the solution shall be easy to use and roll out, based on proven approaches, in a way that facilitates procurement and maintenance of future toll roads.

The approach applied in this analysis is red/ yellow/ green, on the basis of the work done so far on this Deliverable, or specially undertaken, as shown in Appendix 3. That required a special risk analysis for securing means and usability for users. A simplified model was used to look into the financial consequences by applying cost and benefits taken from similar schemes. Note that this was the first iteration of financial modeling meant to identify the broadest trends. Further detailed modeling is described later in the paper.

D.2.Narrowing the Number of Solutions

The first key test is the financial one. Test have been undertaken using only preliminary assessments of costs and benefits, being clear that these will be further elaborated for the selected options. These assumptions and baseline data are presented in detail in Appendix 7.

The Figure below shows in green the areas that may generate sufficient revenue by combining technologies and networks (more than BGN 400 million annually), and in yellow those with over BGN 300 million annually. This shows that:

- GNSS e-tolling of freight vehicles on motorways and class 1 roads meets the revenue target at affordable/ reasonable charge per km and without any change for light vehicles (BGN 488 million net per annum, as shown on both figures)

- Class 2, or class 2 and 3 roads could be added may be at a lower general rate (now or in future), without additional revenue (up to BGN 808 million)
- The e-vignette for light vehicles does not add much net value at current rates (about BGN 24 million), but is a way for the future without changing charges now
- Charging all vehicles bridges the revenue gap only with DSRC on motorways and class 1 roads (BGN 709 million) or GNSS down to class 3 roads (BGN 653 million), but requires high charges per km for light vehicles (0.06 BGN/km), which is hardly likely to be acceptable. However, then DSRC is limited to motorways and class 1 roads (so it is not a future proof)
- The greater share of revenue may be obtained easier and faster through GNSS tolling only of heavy vehicles then through more complicated solutions including DSRC or tolling of all vehicles. That is the least risky option offering the best return.

Figure 12. Revenue Projection, including GNSS for Light Vehicles

| Възможни политики - нетни приходи (млн. лева) | | | | | | | |
|--|--------------------------------|-------------------------|--|--------------------|---------|-----------|--|
| Най-малко 400 млн. лева са необходими за ефективно финансиране на пътната инфраструктура | | | | | | | |
| База за сравнение Винетна система | Е-тол автобуси и Винетни | HGV + текущи леки | Е-тол автобуси и е-винетки ЛПС и автомобили | HGV + е-винетки | Е-тол | Всички ПС | |
| | | | | | | | |
| | | | | | | | |
| | DSRC | GNSS | DSRC | GNSS | DSRC | GNSS | |
| Магистрала | 218 | неприложим | 252 | неприложим | 307 | неприл. | |
| Магистрала + 1-во класни пътища | 392 | 464 | 417 | 488 | 709 | -156 | |
| М-ла + 1-во и 2-ро класни пътища | неприложим | 674 | неприл. | 703 | неприл. | 347 | |
| М-ла + 1-во, 2-ро и 3-то класни пътища | неприложим | 773 | неприл. | 806 | неприл. | 653 | |
| Средни тол-ставки | | | | | | | |
| Средни тол-ставки на км HGV + автобуси в лева | | 0.24 | | | | | |
| Средни тол-ставки на км за леки превозни средства и автомобили | | 0.06 | | | | | |

Figure 13. Projection of Tolling at Lower Charges for Light Vehicles

| Възможни политики - нетни приходи (млн. лева) | | | | | | | |
|--|--------------------------------|-------------------------|--|--------------------|---------|-----------|--|
| Най-малко 400 млн. лева са необходими за ефективно финансиране на пътната инфраструктура | | | | | | | |
| База за сравнение Винетна система | Е-тол автобуси и Винетни | HGV + текущи леки | Е-тол автобуси и е-винетки ЛПС и автомобили | HGV + е-винетки | Е-тол | Всички ПС | |
| | | | | | | | |
| | | | | | | | |
| | DSRC | GNSS | DSRC | GNSS | DSRC | GNSS | |
| Магистрала | 218 | неприложим | 252 | неприложим | 232 | неприл. | |
| Магистрала + 1-во класни пътища | 392 | 464 | 417 | 488 | 444 | -421 | |
| М-ла + 1-во и 2-ро класни пътища | неприложим | 674 | неприл. | 703 | неприл. | -81 | |
| М-ла + 1-во, 2-ро и 3-то класни пътища | неприложим | 773 | неприл. | 806 | неприл. | 110 | |
| Средни тол-ставки | | | | | | | |
| Средни тол-ставки на км HGV + автобуси в лева | | 0.24 | | | | | |
| Средни тол-ставки на км за леки превозни средства и автомобили | | 0.02 | | | | | |

D.3.Evaluation of Other Factors

Though revenues are a key driver, an evaluation was performed of all other aspects mentioned in this Deliverable (e.g. possibility to implement the policy), including how easy the option would be to use by light and heavy vehicles. These are summarized hereunder - full details of each aspect subjected to evaluation are provided in Appendix 3.

Figure 14. Summary of all Factors Impacting Strategic Options

| | Настояща винетна система | Етол таксуване на камиони | е-винетки за ЛПС | етол таксуване за всички ПС |
|------------------------------------|--------------------------|---------------------------|------------------|-----------------------------|
| политики | | | | |
| приходи | | | | зависи от ставките |
| правни | | | | |
| социално-икономически/околна среда | | | | |
| реализация | | | | |
| риск за реализиране на приходите | | | | |
| обществени поръчки | | | | |

This table shows that:

- The current vignette fee neither supports the policy, nor can secure sufficient revenue
- Only etolling of trucks and evignette of light vehicles have no significant issues of delivery
- Etolling all vehicles would not deliver the revenue needed without high charges for light vehicles (with associated socio economic impacts), would not be easy to use for light vehicles and would be a key delivery risk

Since implementation of e-tolling features three red areas, **each one of which is sufficient to dismiss any further evaluation**, the recommendation made in Deliverable 0 was to focus on:

- E-tolling for trucks only and e-vignette for light vehicles
- Considering options for roads class 2 and 3 in addition to motorways and roads class 1, since diversion and traffic flow are important
- Studying e-tolling rates in comparison with the revenue balance for that option
- Considering e-vignette fees and the possibilities to reduce costs by means of a single contract

Even if the initial revenue evaluation would change in future, it has been agreed that the remaining red factors, such as easy use, shall preclude from further consideration e-tolling of all vehicles.







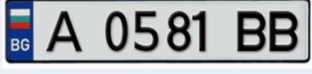



Deliverable 0 was focused on feasible scenarios in a set of strategic options, which were then studied in greater detail based on GNSS for heavy vehicles and e-vignette for light vehicles at various levels of road coverage and tariffs.

D.4.Vision for the Service

The vision is based on a review of the current vignette system and best practices of e-tolling and e-vignettes as developed in other parts of Europe and worldwide. The purpose of our strategy has been to elaborate a vision, which brings the lowest risk in case additional funds are secured quickly, generates good net revenues due to the cost-effectiveness of the solution and is well accepted by users. That implies that solutions proven elsewhere shall be adopted and tailored for Bulgaria, rather than assuming a more innovative but potentially risky technical approach.

The overall vision for the system is shown in the figure below.

Figure 15. Proposed Vision

| User | What they need to do | How and where they pay | How they are enforced |
|---|--|--|---|
|  Bulgarian >3.5t | <ul style="list-style-type: none"> Use tech already in truck Or buy a new OBU Or buy a route pass | <ul style="list-style-type: none"> Account – pre pay or post pay (if good credit) |   Checks of number plates ↓ Penalty to vehicle owner ↓  →  |
|  Bulgarian and foreign < 3.5t | Buy an evignette giving  |  | |
|  Foreign >3.5t | <ul style="list-style-type: none"> Buy a route pass Buy or rent an OBU ;or  | <ul style="list-style-type: none"> Account single payment or EETS | |

This shows that:

- Bulgarian heavy vehicles would be electronically tolled using either existing technology in their vehicles or via new on board units or for occasional users, simply by buying “route passes” that allow travel on a particular route and time
- Bulgarian and foreign light vehicles will buy an evignette, similar to the current approach but linked to their number plate and stored electronically
- Foreign and transit vehicles would buy route passes, buy or rent an on board unit or in the future, use EEST services

Payments can be made to accounts with Service Providers by using bank or debit cards, or bank accounts, or linked to other forms such as fuel cards. Users can pay on line, by phone, or by post and e-vignettes can be also bought for cash at post offices.

All three types of user can be enforced by the same system that checks number plates against payments and issues penalties to non-compliant users. The enforcement will be a mix of mobile and fixed sites that will be discussed in detail in the next phase.

Key benefits of this are:

- Such a system can be procured readily in the market with a minimal risk for the supplier-contractor that would supply the entire technology and base services. Later other companies may provide added services, for example use of existing equipment inside vehicles for fleet management for securing data needed to calculate toll charges
- The capture of the key revenue from transit traffic can be by “route passes” or adjustment of on board units, and in future by operationally connected EEST interoperable units, and by potential use of the current customs organization.
- Enforcement of the e-tolling system provides a good opportunity to also deploy an e-vignette system for light vehicles in the same contract.
- This approach could help deliver other government policies, for example reduction of emissions from vehicles by different pricing and support for future Intelligent Transport System Services

Regardless of all that, there are legal and institutional aspects that need to be addressed to support introduction of e-tolling and e-vignettes.

Additional analyses have been undertaken in the current Deliverable focusing on revenues and operational models.

Chapter 2: Draft Master Project Management Plan (including a Draft Project Charter)

Summary

The purpose of this Master Project Management Plan (MPP) is to capture and define ‘how’ the project will be managed throughout the project life cycle, and to provide Government and other project stakeholders with an approved working guide for how the project will be managed. The MPP describes how to manage the activities of the project, the contractor (or contractors), and other supporting organizations throughout the project life cycle phases to ensure a timely, efficient, and effective system implementation and operation.

Hence it will be a living document, continuously updated.

The Project Management Plan is based primarily on the project management processes described in the Project Management Body of Knowledge (PMBOK), 5th edition and addresses the following areas of knowledge:

Project Integration Management :

- processes and activities to identify, define, combine, unify, and coordinate the various processes and project management activities within the Project Management Process Groups.

Project Scope Management :

- processes to ensure that the project includes all the work required, and only the work required, to complete the project successfully.

Project Time Management :

- processes to manage the timely completion of the project.

Project Cost Management :

- processes for planning, estimating, budgeting, financing, funding, managing, and controlling costs so that the project can be completed within the approved budget.

Project Quality Management :

- processes and activities of the performing organization that determine quality policies, objectives, and responsibilities so that the project will satisfy the needs for which it was undertaken.

Project Human Resource Management :

- processes that organize, manage, and lead the project team.

Project Communications Management :

- processes required to ensure timely and appropriate planning, collection, creation, distribution, storage, retrieval, management, control, monitoring, and the ultimate disposition of project information.

Project Risk Management :

- processes of conducting risk management planning, identification, analysis, response planning, and controlling risk on a project.

Project Procurement Management :

- processes necessary to purchase or acquire products, services, or results needed from outside the project team

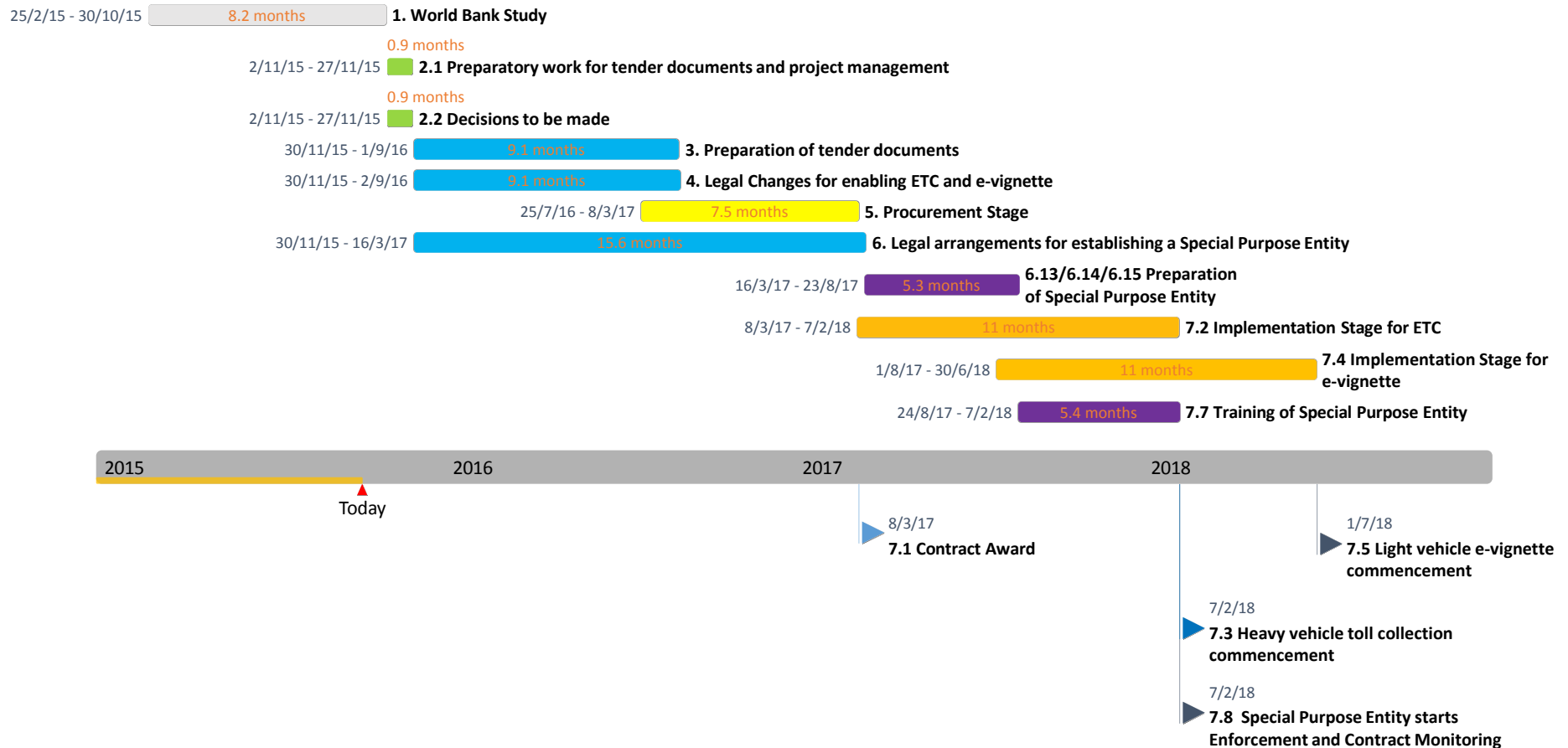
Project Stakeholders Management :

- processes to identify all people or organizations impacted by the project, analyzing stakeholder expectations and impact on the project, and developing appropriate management strategies for effectively engaging stakeholders in project decisions and execution.

One of the main elements of this Master Plan is the project schedule. The high level schedule is shown below.

This schedule assumes that a Special Purpose Entity is required for all aspects of tolling procurement and enforcement, as well as overseeing the Contractor as discussed in the Deliverable section on procurement. If this is not required, the overall go live timelines do not change as this Entity is not on the critical path for delivery as an enforcement body will still have to be trained.

Main Tasks and Milestones – Overall Project Schedule



The milestones indicated along the timeline at the bottom of the diagram shows that the plan enables the following achievements:

- Award a contract for provision of the necessary systems and services - March 2017
- Commencement of e-toll collection for Heavy vehicles - February 2018
- Commencement of e-vignette operations for Light Vehicles - July 2018. Note that this is split from e-tolling to spread customer operations, communications and testing loads
- Commencement of enforcement operations and contract monitoring by a Special Purpose Entity or other enforcement body as required - February 2018

The main activities and products are:

- Preparation of tender documents
- Legal changes to enable e-tolling and e-vignette
- Legal changes to establish the Special Purpose Entity (if required)
- Contractor implementation of systems
- Contractor delivery of operational services for the duration of the contract
- Handover of enforcement facilities to the Special Purpose Entity or other body

The World Bank study will be complete by the end of October 2015. After that, it is essential that two tasks (shown in green) are started immediately:

- **Decisions to be made.** This task is for Government to make final decisions on the main issues that are identified in the World Bank study that need to be resolved. Without these decisions, it is impossible to proceed.
- **Planning for preparation of the Tender Documents and Project Management.** This task is to plan and organize the tasks needed to deliver the tender documents and to put in place all of the necessary project management documentation (as described in the Master Project Plan).

As part of the preparation of Tender Documents it will be necessary to capture requirements from a wide range of stakeholders. In particular, as described in Deliverable 1 there are many potential benefits to be obtained by close co-operation between the e-tolling /e-vignette systems and Intelligent Transport Systems (ITS).

Therefore during this phase of activity it will be necessary to work closely with the organisations involved in the development of ITS in Bulgaria to ensure that data and

information flows and system architecture considerations are addressed and the full benefits can be obtained in the future. During this phase it will be necessary to analyse the implementation plans for ITS to identify when particular functionality may be required.

When both of these tasks are complete, the three main activities (shown in blue) can be started:

- **Preparation of Tender Documents.** This is a major task that involves a broad range of parties with the necessary skills and experience of preparing such documents. It also involves the stakeholders since it is necessary to identify and capture their requirements for inclusion in the tender documents.
- **Legal changes for enabling e-tolling and e-vignette.** This is a sequence of tasks to identify and make the necessary legislative changes to enable e-tolling and e-vignette to be used for charging for the use of roads in Bulgaria. There will also be some legislative changes needed to support the introduction of a Government Special Purpose Entity (if required).
- **Legal Stages for the establishment of a Government Special Purpose Entity.** These are the legal tasks necessary to implement legislation to introduce the Special Purpose Entity (if required).

When the first two of these tasks are complete, it is then possible to start the procurement process (shown in yellow). It has been assumed that this process cannot be started until the necessary legislative changes have been made. However, it has also been assumed that the legal stages required for introduction of the Government Special Purpose Entity can be continued in parallel with the procurement process.

After the procurement stage, a contract is awarded and implementation commences (shown in orange). During the implementation stage there are two main milestones:

- Commencement of revenue collection using the e-tolling system
- Commencement of revenue collections using the e-vignette system

These have been separated in time since the e-tolling based toll collection should start as early as possible, and the e-vignette system should commence at a time that makes the transition between the existing vignette scheme and the e-vignette scheme possible and convenient for road users. Since the existing sticker vignette scheme includes annual vignettes, a plan will be required to phase out the sales of these, so that no annual vignettes will be sold for the period beyond the commencement dates of both the e-tolling and e-vignette systems. The e-vignette system is shown as starting in July 2018, so the plan must enable the phasing out of sticker vignettes to match this date. The planning of this requires consultation and coordination with those responsible for management of the existing sticker vignette scheme.

It has been assumed that the Special Purpose Entity will require time to implement in terms of staffing, offices and facilities (shown in purple), and that a period of training is required before the Entity can commence enforcement activities and contract monitoring which must both start at the same time as the e-tolling system goes live in February 2018.

8. Introduction

In this document a draft version of the Master Project Management Plan (MPP) is presented.

A. Purpose

The purpose of the Master Project Management Plan is to capture and define ‘how’ the project for delivery of toll collection systems and services in Bulgaria will be managed throughout the project life cycle, and to provide the project stakeholders with an approved working guide for how the project will be managed. The MPP describes how to manage the activities of the project, the contractor (or contractors), and other supporting organizations throughout the project life cycle phases to ensure a timely, efficient, and effective system implementation and operation.

B. Scope of this Master Project Management Plan

This Master Project Management Plan identifies the activities, processes, and procedures used to manage the project. The MPP further presents the methodology for project management that will be employed for each project management phase, as well as a brief description of each of the component plans of the MPP.

This Master Project Management Plan is based primarily on the project management processes described in the PMBOK, 5th edition. The methodology for planning the project utilizes the aspects of the PMBOK where applicable to the project based on its size, complexity, and staff resources.

The scope of PMBOK is shown below in Figure 16 which identifies the following 10 areas of knowledge.

Figure 16. Scope of PMBOK

Project Integration Management :

- Project Integration Management includes the processes and activities needed to identify, define, combine, unify, and coordinate the various processes and project management activities within the Project Management Process Groups.

Project Scope Management :

- Project Scope Management includes the processes required to ensure that the project includes all the work required, and only the work required, to complete the project successfully.

Project Time Management :

- Project Time Management includes the processes required to manage the timely completion of the project.

Project Cost Management :

- Project Cost Management includes the processes involved in planning, estimating, budgeting, financing, funding, managing, and controlling costs so that the project can be completed within the approved budget.

Project Quality Management :

- Project Quality Management includes the processes and activities of the performing organization that determine quality policies, objectives, and responsibilities so that the project will satisfy the needs for which it was undertaken.

Project Human Resource Management :

- Project Human Resource Management includes the processes that organize, manage, and lead the project team.

Project Communications Management :

- Project Communications Management includes the processes that are required to ensure timely and appropriate planning, collection, creation, distribution, storage, retrieval, management, control, monitoring, and the ultimate disposition of project information.

Project Risk Management :

- Project Risk Management includes the processes of conducting risk management planning, identification, analysis, response planning, and controlling risk on a project.

Project Procurement Management :

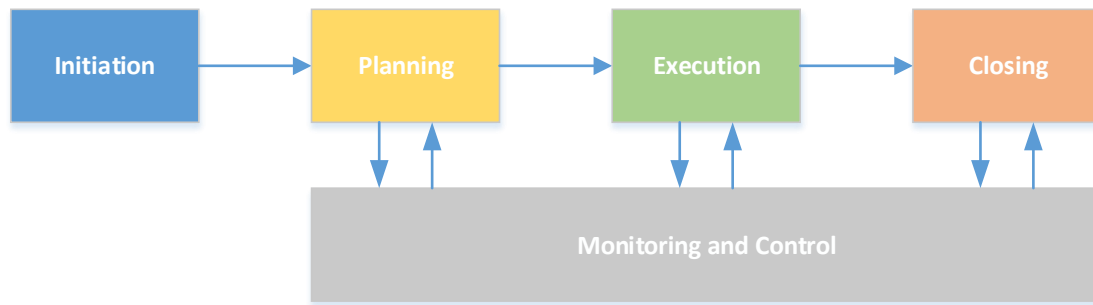
- Project Procurement Management includes the processes necessary to purchase or acquire products, services, or results needed from outside the project team

Project Stakeholders Management :

- Project Stakeholder Management includes the processes required to identify all people or organizations impacted by the project, analyzing stakeholder expectations and impact on the project, and developing appropriate management strategies for effectively engaging stakeholders in project decisions and execution.

Within each of these areas of knowledge, project management processes are defined. There are a total of 47 processes typically used during the management of a major project. These processes are used at different times throughout the project. From the point of view of project management, a typical project is divided into 4 main project management phases as shown in Figure 17 below.

Figure 17. Project Management Phases



The diagram shows that 4 of the phases run as a sequence from initiation through to closure of the project. The 5th phase, Monitoring and Control, runs in parallel to the main phases of the project. This is a simplification on most projects, because changes or unexpected events can sometimes result in the need to replan and change the execution, however for the purposes of explaining the content of this document the diagram is sufficient.

The following table shows which of the processes contained within each Knowledge Area are used within each of the Project Management Phases.

Table 2. Mapping of Knowledge Areas onto Project Phases for Delivery of Tolling in Bulgaria

| Knowledge Areas | Project Phase | | | | |
|--|-------------------------|--|---|---|---------------|
| | Initiation | Planning | Executing | Monitoring and Control | Closing |
| Project Integration Management | Develop Project Charter | Develop Project Management Plan | Direct and Manage Project Work | Monitor and Control Project Work Perform Integrated Change Control | Close Project |
| Project Scope Management | | Plan Scope Management Collect Requirements Define Scope Create WBS | | Validate Scope Control Scope | |
| Project Time Management | | Plan Schedule Management Define Activities Sequence Activities Estimate Activity Resources Estimate Activity Durations Develop Schedule | | Control Schedule | |
| Project Cost Management | | Plan Cost Management Estimate Costs Determine Budget | | Control Costs | |
| Project Quality Management | | Plan Quality Management | Perform Quality Assurance | Control Quality | |
| Project Human Resource Management | | Plan Human Resource Management | Acquire Project Team Develop Project Team Manage Project Team | | |
| Project Communications Management | | Plan Communications Management | Manage Communications | Control Communications | |
| Project Risk Management | | <ul style="list-style-type: none"> Plan Risk Management Identify Risks Perform Risk Analysis Plan Risk Responses | | <ul style="list-style-type: none"> Control Risks | |

| Knowledge Areas | Project Phase | | | | |
|--|---|---|---|--|--|
| | Initiation | Planning | Executing | Monitoring and Control | Closing |
| Project Procurement Management | | <ul style="list-style-type: none"> Plan Procurement Management | <ul style="list-style-type: none"> Conduct Procurements | <ul style="list-style-type: none"> Control procurements | <ul style="list-style-type: none"> Close procurements |
| Project Stakeholders Management | <ul style="list-style-type: none"> Identify Stakeholders | <ul style="list-style-type: none"> Plan Stakeholder Management | <ul style="list-style-type: none"> Manage Stakeholder Engagement | <ul style="list-style-type: none"> Control Stakeholder Engagement | |

C References

- Project Deliverable Number 1
- Project Charter

D Document Maintenance

This document will be reviewed and updated as needed, as the project proceeds through each phase. Lessons learned as a result of continuing staff management efforts will be captured at the end of each project phase and used to improve the project.

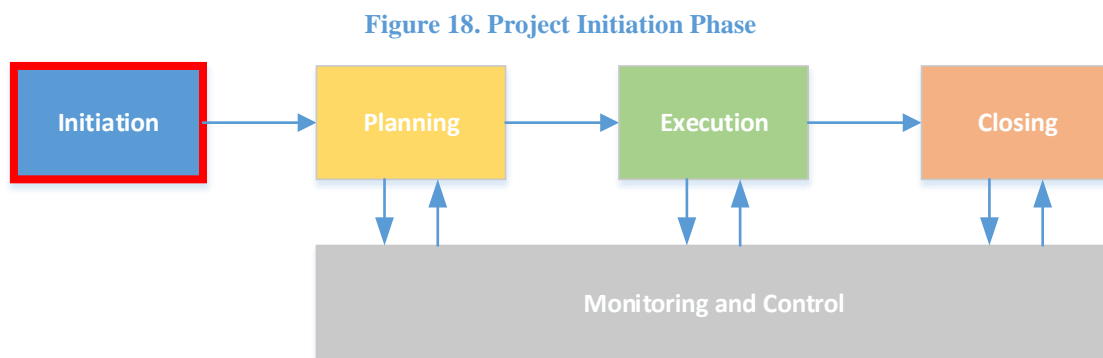
E Relationship between this Master Project Management Plan (MPP) and the Contractor's Project Management Plan (PMP)

The MPP is developed and controlled by the project management team and is the highest-level project management document. The MPP is for the project management team to manage the entire process of system implementation, bringing the system into operation, and continuing operations.

The contractor's PMP is a contractually defined management document to be developed by the contractor to manage his obligations. The PMP is subordinate to the MPP and will be developed by the contractor according to specific requirements that will be included in the contract documents.

9 Project Initiation Phase

This section describes the processes involved in carrying out the project initiation phase of the project management activities, as illustrated in the diagram below.



A Develop Project Charter

This is the process of developing a document that authorizes the project by its being endorsed and agreed by “signing up” of the project sponsor and senior management of both contractor and Government. The Project Charter contains high level details about the project objectives, scope,

timescales, and budget. The Project Charter also gives the Project Manager authority to plan and execute the project.

A draft outline Project Charter is contained in Appendix B. The contents of this when it is finalized will be based on:

- The deliverables that are being delivered in the study being undertaken by the World Bank.
- Decisions made immediately following the completion of the study by the World Bank about key aspects of the project
- A workshop to be held to specifically complete and agree the project charter

B Identify Stakeholders

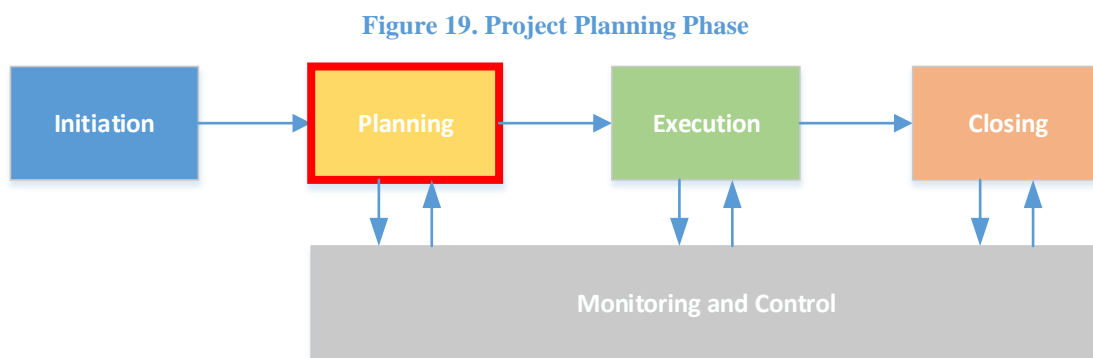
This is the process of identifying the people, groups or organizations that could impact or be impacted by a decision, activity or outcome of the project both within Bulgaria and internationally. Part of this process is to analyse and document the interests, involvement, interdependencies, influence and potential impact on project success.

Appropriate tools will be used to carry out the analysis and documentation, this will result in the main inputs that are required for the Stakeholder Management process.

An initial list of stakeholders is presented in Section 0.

10 Project Planning Phase

This section describes the processes involved in carrying out the planning phase of the project management activities, as illustrated in the diagram below.



A Develop Project Management Plan

This is the process of defining, preparing, and co-ordinating all of the various project related plans (described in Sections 3.2 to 3.10 below) and integrating them into one comprehensive Project Management Plan.

This document is the draft version of this Project Management Plan. It will need to be added to continually as part of the planning phase of the project. The contents will be based on:

- The results of this study work being carried out by The World Bank once reviewed by Government
- The Project Charter
- Any additional specific management or statutory requirements identified by Ministry of Regional Development, Ministry of Transport, Information Technologies and Communications, Ministry of Finance or RIA

B Plan Scope Management

The processes for management of project scope will be defined in separate document - the Scope Management Plan. This is important since it ensures that the project includes all work required and only the work required to successfully deliver the desired results. Defining the scope means identifying what is and what is not included in the project.

10.B.1 Approach to Scope Management

This project is a major IT project. It is vital to manage the scope of major IT projects in order to prevent “scope creep” affecting deliverability, budget, and timescales. The majority of major IT procurement project failures around the world have been caused in one way or another by scope creep.

The project scope will be managed through the project documents, reviews, and change control processes established throughout the project’s phases.

The project will be managed to ensure that the project scope baseline is maintained and consistent. Project documents will be reviewed to ensure the scope as established in the Project Charter, Feasibility Study Report, and in this Project Management Plan is not inadvertently altered or changed. The project scope will primarily be managed through the project’s scheduled reviews in regular meetings including Project Status/Progress Meetings, Contractor Meetings, and Steering Committee Meetings, and through the change control process. Communication will play a key role in scope management. The project will establish several forms of verbal and written communication described in the project Communication Plan to ensure stakeholders, sponsors, executive management, team members, external agencies, and Contractors involved in the project have a clear understanding of the project scope. There are so many elements that could affect a project’s scope within a project that the very nature of scope dictates that its management is integrated in all aspects of the project.

10.B.2 Work Breakdown Structure (WBS)

The WBS is a multi-level breakdown of the work to be executed by the project team, to accomplish the project objectives and create the required deliverables. The WBS organizes and defines the total scope of project. The WBS subdivides the project work into smaller, more manageable pieces of work.

The project work breakdown structure is provided in Appendix A.

10.B.3 Formal Acceptance of Scope

The formal acceptance of the project scope is to be accomplished through the Project Charter. The Project Charter will be prepared and submitted by the Project Manager and the Project Director. The charter will be distributed and coordinated through the Project Sponsor and executive management staff with final approval by the Project Director.

A draft version of the Project Charter is contained in Appendix B.

C Plan Time Management

This includes the processes required to accomplish timely completion of the project. This is achieved using a schedule. The Time Management processes include:

- The development of the schedule (using Microsoft Project)
- Management of the schedule including changes
- Monitoring, controlling, and reporting on the schedule throughout the project life cycle.

The Time Management Plan of the project centres on the overall project schedule. The project used a top-down approach to develop the project work breakdown structure that was used as the foundation for the development of the overall project schedule. The project consists of the following major parts as shown in the work breakdown structure, Appendix A.

These major parts were then broken down further into the major activities that make up each of these parts. With the exception of the Project Contractor Development activities, all the major activities were broken down into subordinate activities and finally down to the task level.

A combination of bottom-up (analysis of tasks) and top-down (setting the major milestones dates and constraints) approach was taken to establish the durations depending on the activity, task, or dependency. Through several iterations and alignment of activities and tasks, the overall project schedule was produced and established. The Project Schedule is presented in Section 0.

The project uses Microsoft Project as a tool to integrate, monitor, manage, and control the overall project schedule. The overall project schedule will be baselined and any changes or variations to the schedule will be reflected and captured in Microsoft Project, and can be viewed using the Tracking GANTT view function in the application. The Project Scheduler will assess schedule impacts on a regular basis, monitor the progress, and identify areas where the schedule is or may fall behind. The Project Scheduler will bring any items that potentially impact the schedule's critical path to the Project Managers' attention. The Project Scheduler will use Microsoft Project to continually re-assess the project's critical path and recommend actions to avoid schedule slips or mitigate impacts.

The schedule will follow a formal change control process for any proposed changes to the schedule. The change control process for the project schedule is described later in this document.

D Plan Cost Management

This process is to develop a Cost Management Plan with the objective of ensuring that the project team and its contractors will complete the project within budget. Cost management also includes analysis of options and issues to determine the potential effect on the project's budget and operations.

The project Cost Management Plan will be provided as a separate plan and addresses how project cost will be planned, structured, and controlled for the project and identifies the cost management processes and tools to be used.

E Plan Quality Management

This process is to develop a Quality Management Plan that will define, measure, and improve the quality of the project's processes and products in order to fulfil the success criteria. Quality management establishes the processes by which project products and processes must adhere to specified requirements and established plans throughout the project life cycle.

The project Quality Management Plan will be provided as a separate plan that describes how the necessary quality policies will be implemented and how the project management team plans to meet the quality requirements set for the project.

The Project Contractor will provide a Quality Management Plan for their portion of the project as a deliverable product of the contract.

F Plan Human Resources Management

This process is to develop a Human Resources Management Plan that identifies the processes and procedures used to manage people throughout the project's life. The plan describes the planning and acquisition to the team of both state staff and consulting staff and describes the responsibilities assigned to each staff.

The project Human Resources Management Plan will be provided as a separate plan and addresses the how staff acquisition, training, tracking, and management will be managed and controlled for the project.

G Plan Communication Management

This process is to develop a Communication Management Plan that includes processes by which project information is developed, maintained, and managed for both internal and external project stakeholders including the public and road users. An initial list of stakeholders is presented in Section 0.

The project Communication Management Plan will be provided as a separate plan and describes the approach and processes to be used for communication management.

H Plan Risk Management

This process is to develop a Risk Management Plan that includes processes by which potential threats to project success are identified, allocated, mitigated, or eliminated. Risk considerations will include technical, management, procurement, performance, budget resources, political, natural disasters, security etc. Risk management is an integral part of project management from project initiation through project completion.

The project Risk Management Plan will be provided as a separate plan and describes the approach and processes to be used for risk management.

I Plan Procurement Management

This process is to develop a Procurement Management Plan that identifies the activities to be performed or initiated by project staff to manage, track, amend, and close a contract. Contractor activities and activities performed by other state organizations are discussed at a high level only to facilitate an understanding of the complete process.

The Project Procurement Management Plan will be provided as a separate plan and describes the approach and processes to be used for procurement management. This will need to take account of Government requirements in addition to any constraints imposed by the Public Procurement Law in Bulgaria.

J Plan Stakeholder Management

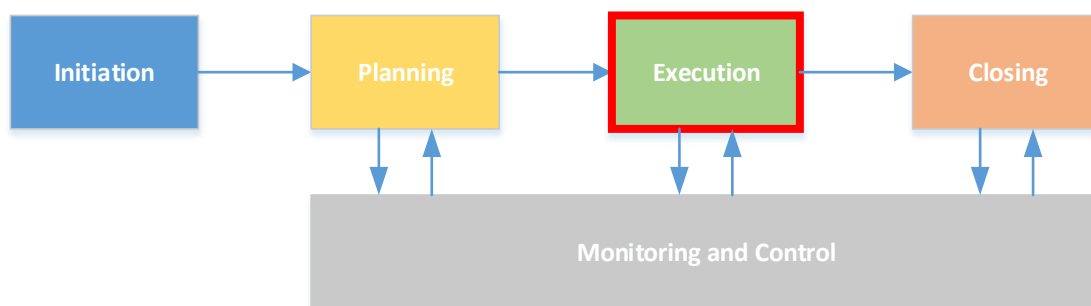
This process is to develop a Stakeholder Management Plan that includes processes for identification of stakeholders and their needs/interest/influence on the project and how stakeholder engagement and communication will be managed and controlled.

The project Stakeholder Management Plan will be provided as a separate plan and describes the approach and processes to be used for stakeholder management.

11 Project Execution

This section describes the processes involved in carrying out the execution phase of the project management activities, as illustrated in the diagram below.

Figure 20. Project Execution Phase



A Direct and Manage the Project Work

The Project Management Plan execution will be initiated through a project Kick-Off Meeting. The Project Kick-Off Meeting provides the forum to integrate all parties involved in the project and focus everyone toward a common set of project objectives. The objective of the kick-off meeting is to provide background and an overview of the project, and to establish a common set of management processes and procedures that the project will use to execute the project through implementation. Completion of this meeting constitutes the formal execution of the Project Management Plan.

The Project Management Plan will continue to be executed throughout the project through the established processes and procedures documented in the various management plans developed by the project Team and the project Contractor. The project Manager is responsible to monitor the execution of the plan and will use status meetings, reports, and project metrics to ensure that the project management plan is being executed. The various meetings and reports are described in the project Communication Plan.

B Perform Quality Assurance

This is the process of ensuring that appropriate quality standards are used and applied. This is achieved by auditing of quality requirements and quality measurements.

C Acquire, Develop and Manage the Project TEAM

11.C.1 Acquire the Resources

This is the process of confirming human resource availability and obtaining the team necessary to complete the project activities. The resources will be required that:

- Have the correct skills and competences for each role
- Are sufficient to satisfy the resource levels identified in the Human Resource Management Plan
- Are made available at the right time

11.C.2 Develop the Resources

In addition to acquiring the project team, it may be necessary to develop competencies, team member interaction, and the overall team environment to achieve a strong and motivated team. Processes will be used to achieve this objective.

11.C.3 Manage the Resources

These are the processes required for management of the team members in terms of performance, resolving issues, managing conflict and providing feedback.

D Manage Communications

The Project Communication Plan describes how information communication will be executed for the project. The Manage Communications process is the process of creating, collecting, distributing, storing, retrieving, archiving, and ultimately disposing of project information in accordance with the Communication Plan. The objective being to achieve efficient and effective communications between project team members and with project stakeholders including the public and other road users.

E Conduct Procurements

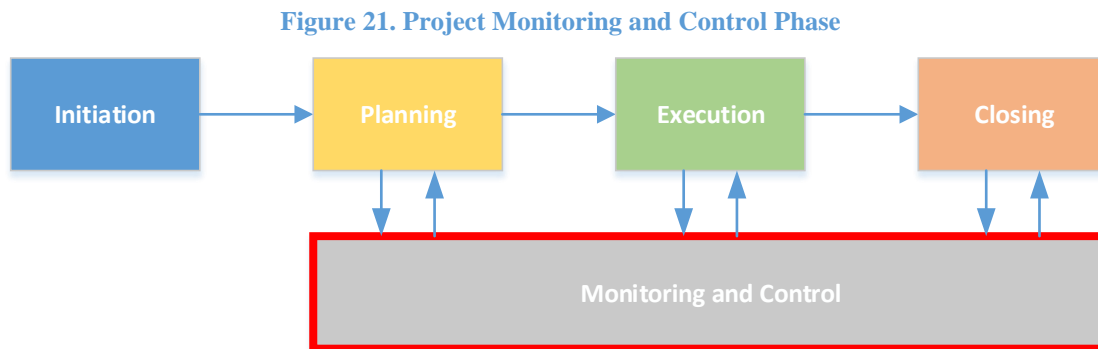
This is the process of procurement including preparation of procurement documentation, preparation of tender evaluation processes and criteria, management of the procurement activities, selecting the winning tender(s), award of contract(s) and management of the contract(s) including management of changes. The process will be executed in accordance with the Procurement Management Plan which will be in accordance with the Public Procurement Law in Bulgaria.

F Manage Stakeholder Engagement

This is the process of communicating and working with stakeholders to meet their needs/expectations, address issues as they occur and achieve appropriate levels of stakeholder involvement in the project at appropriate times during the project life. It will be carried out in accordance with the Stakeholder Management Plan and the Communications Management Plan.

12 Project Monitoring and Control

This section describes the processes involved in carrying out the monitoring and control phase of the project management activities, as illustrated in the diagram below.



A project monitoring and control process is necessary for identifying and controlling factors that create changes to make sure those changes are beneficial, determining whether a change has occurred, and managing the approved changes when they occur.

A Monitor and Control Project Work

This is the process of tracking, reviewing and reporting on progress in terms of budget, time schedule, and scope. It is a continuous process that continues through the planning, execution and closing project management phases as shown in the diagram above.

Monitoring includes collecting information, measuring performance, and reporting on project information, and assessing measurements and exceptions. Control includes determining corrective or preventive actions and following up on action plans to determine whether the actions taken resolved the issue.

Monitoring and Control will be carried out in accordance with the processes defined in the Project Management Plan. The processes will include performance reporting. The project performance reporting will be accomplished through established status meetings, reports, and internal project tracking systems. The following are a list of mechanisms used that provide performance reporting:

- Project regular Status Meeting
- Project Contractor regular Status Meeting
- Monthly Steering Committee Meeting
- Project Monthly Status Report
- Monthly Project Status Report
- Contractor Monthly Status Report
- Action Item Tracking System
- Risk Database Tracking System
- Deliverable Tracking System

The two major performance metrics to be reported are cost and schedule. The cost is to be tracked in terms of variances to the approved budget and spend plan. The schedule is to be monitored in terms of variances to the established baseline.

B Validate and Control Scope

Validation of the scope is the process of formally ensuring that project deliverables comply with the agreed scope of the project. This will be achieved through the use of appropriate processes for requirements capture, requirements documentation, and verifying requirements traceability.

Although the objective is to have little or no change to the project scope, some changes should be anticipated. In the event that scope changes occur, the changes will be identified through the Change Control process established in the Scope Management Plan. As changes to technical and business requirements, hardware, software, documents, and system design are identified, the

impact to the project's scope will be assessed and addressed during the formal Change Control process.

Scope changes will be classified as internal or external, and project-level or management-level. The following defines what constitutes an internal versus external scope change:

- **Internal Scope Change.** Change that is generated or results within the project organization and structure within Government. Examples are changes in business policies, RIA/Ministry policies, functionality, technical design, resources, etc.
- **External Scope Change.** Change that is generated or results from entities external to the project organization and structure. These changes may be generated or result from external control agencies, legislation, court orders, State mandates and policy, public sector, or environment.

Both the Project Team and the Project Contractor will identify any potential internal scope changes. Any external scope changes will be identified through the Executive Steering Committee and the Project Manager.

C Schedule Control

The project schedule will be monitored, tracked, and controlled by the Project Scheduler. The Project Scheduler will establish and maintain the overall project schedule using Microsoft Project. Once the final project schedule is established and approved, the baseline will be set. Progress and schedule changes will be tracked against the baseline to identify variances.

As part of the time management process and procedures, the Project Scheduler will use established forums within the project to manage the project schedule. The following will be utilized to monitor and track the project schedule:

- Regular project Team Status Meetings
- Regular project Team/Contractor Status Meetings
- Contractor Monthly Status Reports
- Daily communication (as required)

All potential impacts to the project schedule must be reported (verbally or written) to the Project Scheduler prior to a schedule slip occurring. Only activities and tasks on the overall project schedule must be reported to the Project Scheduler.

Project Schedule change requests must be submitted to the Project Scheduler and include the following:

- The activity/deliverable/milestone impacted
- How and why the change is being requested

- Alternatives to meet the original end date
- Revised end date
- Action plan to meet the revised end date

Approval, through the Change Control Process described in the Scope Management Plan is required to change the overall project schedule and/or baseline.

D Control Cost

This is the process of monitoring and controlling the status of project costs and managing changes to the cost baseline. It will be carried out in accordance with the Cost Management Plan.

Approval, through the Change Control Process described in the Scope Management Plan is required to change the overall project budget and/or baseline.

E Control Quality

This is the process of monitoring and responding to results of the execution of quality management activities including recommending necessary changes/corrective actions. The process will use a set of operational techniques to verify that the delivered level of quality meets the project quality requirements.

The process will be carried out in accordance with the project Quality Management Plan.

F Control Communications

This is the process of controlling project communications such that the information needs of the project team and stakeholders are met.

The process will be carried out in accordance with the project Communication Plan.

G Control Risks

This is the process of controlling risks through the implementation of risk response and mitigation plans, monitoring residual risks and identifying new risks as the project progresses.

The process will be carried out in accordance with the project Risk Management Plan.

H Control Procurements

This is the process of controlling procurements through the management of procurement relationships and contracts to ensure that the subject of procurement is successfully delivered by the procurement activities.

The process will be carried out in accordance with RIA, Ministry of Regional Development, and Public procurement Law requirements which will be defined in the Project Procurement Management Plan.

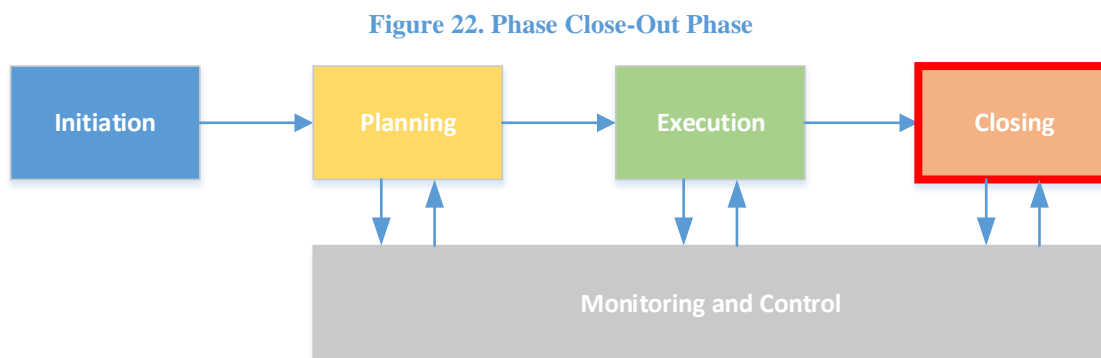
I Control Stakeholder Engagement

This process is for monitoring and controlling overall project stakeholder relationships and for amending plans for engaging with stakeholders as necessary in response to the effectiveness of the relationships or changes that occur as the project progresses.

The process will be carried out in accordance with the Project Stakeholder Management Plan.

13 Phase Close-Out and Lessons Learned

This section describes the processes involved in carrying out the closing phase of the project management activities, as illustrated in the diagram below.



Phase Close-Out and Formal Lessons Learned are project management activities performed at the end of each life cycle phase to ensure the proper closure of a current life cycle phase before proceeding to the next phase. Close-out activities include review of all goals and objectives of the phase, final status and closure of issues and risks related to the phase, and review of documentation and files for archival or destruction.

A Contract Close Out

The following close out items will be performed by the project office:

- Contract Final Reports
- Contractor Evaluation
- Archiving Contractor Records
- Lessons learned

13.A.1 Conducting Formal Lessons Learned

At the close of each life cycle phase, the project prepares a lessons learned report. This includes an analysis of project objectives achieved during the completed phase. Lessons Learned reports will be used for identifying areas for process improvement action and for use by other projects to ensure that valuable knowledge and experienced gained can be effectively reused.

B Administrative Closure

The Administrative Closure is the process of preparing closure documentation of the project deliverables as well as taking other administrative actions to ensure that the project is closed and its assets are redistributed.

- **Financial Closure and Audit.** Completing and terminating the financial and budgetary aspects of the project being performed.
- **Soft Copy of Documentation.** Archiving- creating and storing a hard and/or soft copy of all documentation related to the project
- **Personnel and Facilities.** Reassignment and reallocation of personnel and equipment that have been used during the project

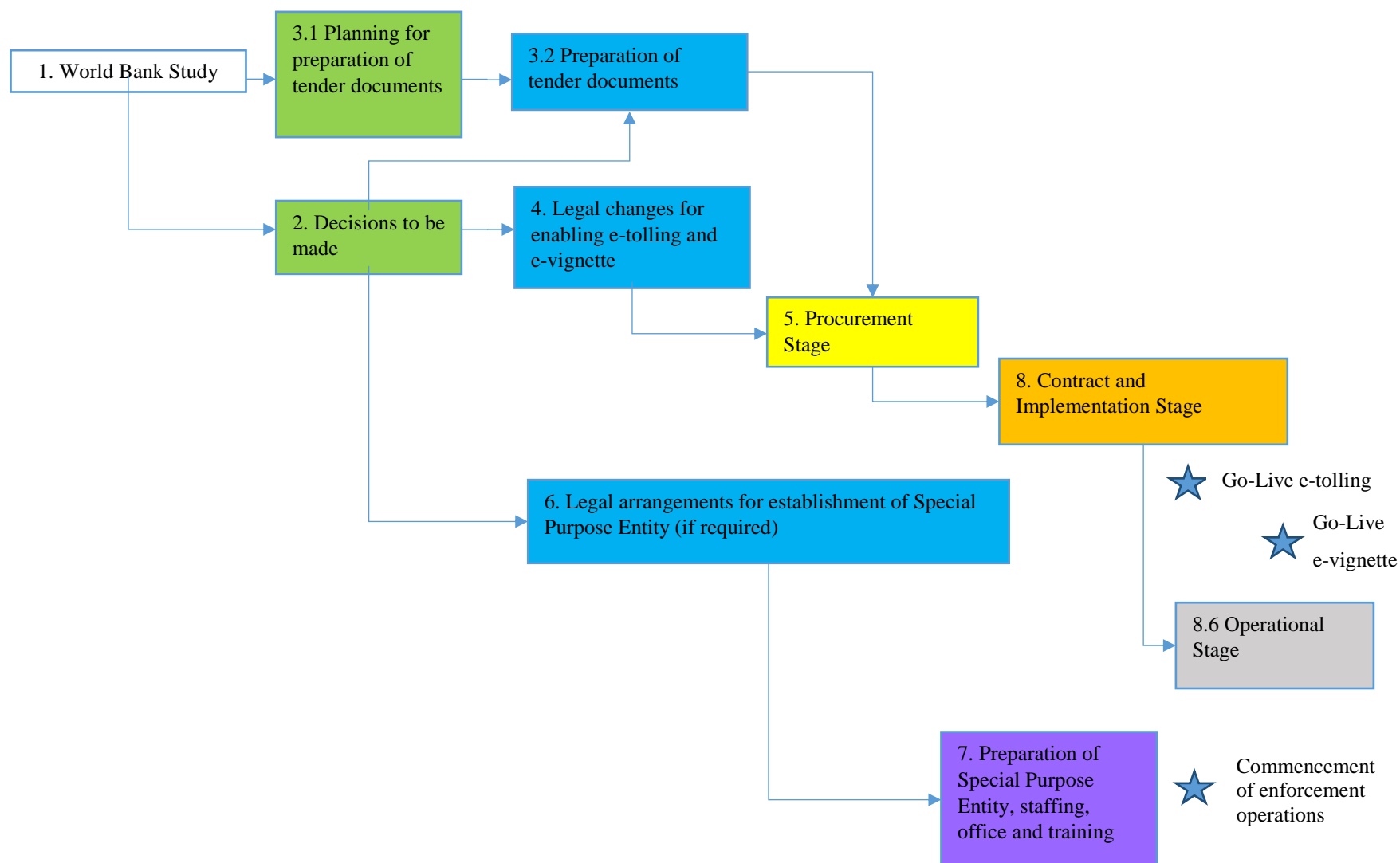
14 Project Schedule

This section describes at a high level the project schedule for delivery of the toll collection systems and services in Bulgaria. The Work Breakdown Structure is presented in Appendix A together with a table listing each task. A more detailed Microsoft Project based project schedule can be found in Appendix C.

The diagram below shows the logical sequence of the main tasks needed to deliver the e-tolling and e-vignette system together with the main milestones. They are shown roughly in a time sequence from left to right. These are described below. The more specific timings of each task and milestone are presented later in this section. The numbers in the diagram refer to the Work Breakdown Structure numbering sequence of tasks and milestones.

This schedule assumes that a Special Purpose Entity is required for all aspects of tolling procurement and enforcement, as well as overseeing the Contractor as discussed in the Deliverable section on procurement. If this is not required, the overall go live timelines do not change as this Entity is not on the critical path for delivery as an enforcement body will still need to be trained. Appendix D contains a revised schedule should this entity not be required.

Figure 23. Project Schedule Flowchart



The milestones indicated along the timeline at the bottom of the diagram shows that the plan enables the following achievements:

- Award a Contract for the provision of the necessary systems and services - March 2017
- Commencement of toll collection using e-tolling for Heavy vehicles - February 2018
- Commencement of e-vignette operations for Light Vehicles - July 2018
- Commencement of enforcement operations and contract monitoring by a Special Purpose Entity or other body - February 2018

The main activities and products are:

- Preparation of tender documents
- Legal changes to enable e-tolling and e-vignette
- Legal changes to establish the Special Purpose Entity
- Contractor implementation of e-tolling and e-vignette systems
- Contractor delivery of operational services for the duration of the contract
- Handover of enforcement facilities to the Special Purpose Entity

The World Bank study will be complete by the end of October 2015. After that it is essential that two tasks (shown in green) are started immediately:

- **Decisions to be made.** This task is for Government to make final decisions on the main issues that are identified in the World Bank study that need to be resolved. Without these decisions it is impossible to proceed.
- **Planning for preparation of the Tender Documents and Project Management.** This task is to plan and organize the tasks needed to deliver the tender documents and to put in place all of the necessary project management documentation (as described in the Master Project Plan).

As part of the preparation of Tender Documents it will be necessary to capture requirements from a wide range of stakeholders. In particular, as described in Deliverable 1 there are many potential benefits to be obtained by close co-operation between the e-tolling/e-vignette systems and Intelligent Transport Systems (ITS).

Therefore during this phase of activity it will be necessary to work closely with the organizations involved in the development of ITS in Bulgaria, to ensure that data and information flows and system architecture considerations are addressed and the full

benefits can be obtained in the future. During this phase it will be necessary to analyze the implementation plans for ITS to identify when particular functionality may be required

When both of these tasks are complete the three main activities (shown in blue) can be started:

- **Preparation of Tender Documents.** This is a major task that involves a broad range of parties with the necessary skills and experience of preparing such documents. It also involves the stakeholders since it is necessary to identify and capture their requirements for inclusion in the tender documents.
- **Legal changes for enabling e-tolling and e-vignette.** This is a sequence of tasks to identify and make the necessary legislative changes to enable e-tolling and e-vignette to be used for charging for the use of roads in Bulgaria. There will also be some legislative changes needed to support the introduction of a Government Special Purpose Entity if it is decided to be required.
- **Legal Stages for the establishment of a Government Special Purpose Entity.** These are the legal tasks necessary to implement legislation to introduce the Special Purpose Entity if required.

When the first two of these tasks are complete, it is then possible to start the procurement process (shown in yellow). It has been assumed that this process cannot be started until the necessary legislative changes have been made. However it has been assumed that the legal stages required for introduction of the Government Special Purpose Entity can be continued in parallel with the procurement process.

After the procurement stage, a contract is awarded and implementation commences (shown in orange). During the implementation stage there are two main milestones:

- Commencement of toll collection using the e-tolling system
- Commencement of toll collection using the e-vignette system

These have been separated in time since the e-tolling should start as early as possible and the e-vignette system should commence at a time that makes the transition between the existing vignette scheme and the e-vignette scheme possible and convenient for road users. Since the existing sticker vignette scheme includes annual vignettes, a plan will be required to phase out the sales of these so that no annual vignettes will be sold for the period beyond the commencement dates of both the e-tolling and e-vignette systems.

The e-vignette system is shown as starting in July 2018, so the plan must enable the phasing out of sticker vignettes to match this date. The planning of this requires consultation and coordination with those responsible for management of the existing sticker vignette scheme.

It has been assumed that the Special Purpose Entity (if required) will need time to implement in terms of staffing, offices and facilities (shown in purple), and that a period of training is required before the Entity can commence enforcement activities and contract monitoring which must both start at the same time as the e-tolling system goes live in February 2018.

To avoid over complication of the diagrams, not shown on the project schedule are the project management tasks which include management of communications with stakeholders. This will be vitally important to ensure that road users, haulage companies and other important stakeholders such as vehicle hire companies, receive sufficient warning about the project and obligations of road users and how this will affect their businesses.

Also not shown are the tasks necessary to achieve a smooth transition between the existing vignette scheme and the new e-vignette scheme. This will entail a phasing out of the existing vignettes to match the implementation plan of the new e-vignette scheme.

The diagrams below present the following:

- Overall Project Schedule showing the main tasks and milestones
- More detailed tasks and milestones for changing legislation to support e-tolling and e-vignette
- More detailed tasks and milestones for the legal tasks associated with the establishment of the Special Purpose Entity if required
- More detailed tasks and milestones for the procurement process

Appendix C contains the detailed Microsoft Project Gantt chart on which these diagrams are based. Appendix D contains a revised schedule should this not be required.

Figure 24. Main Tasks and Milestones

Main Tasks and Milestones – Overall Project Schedule

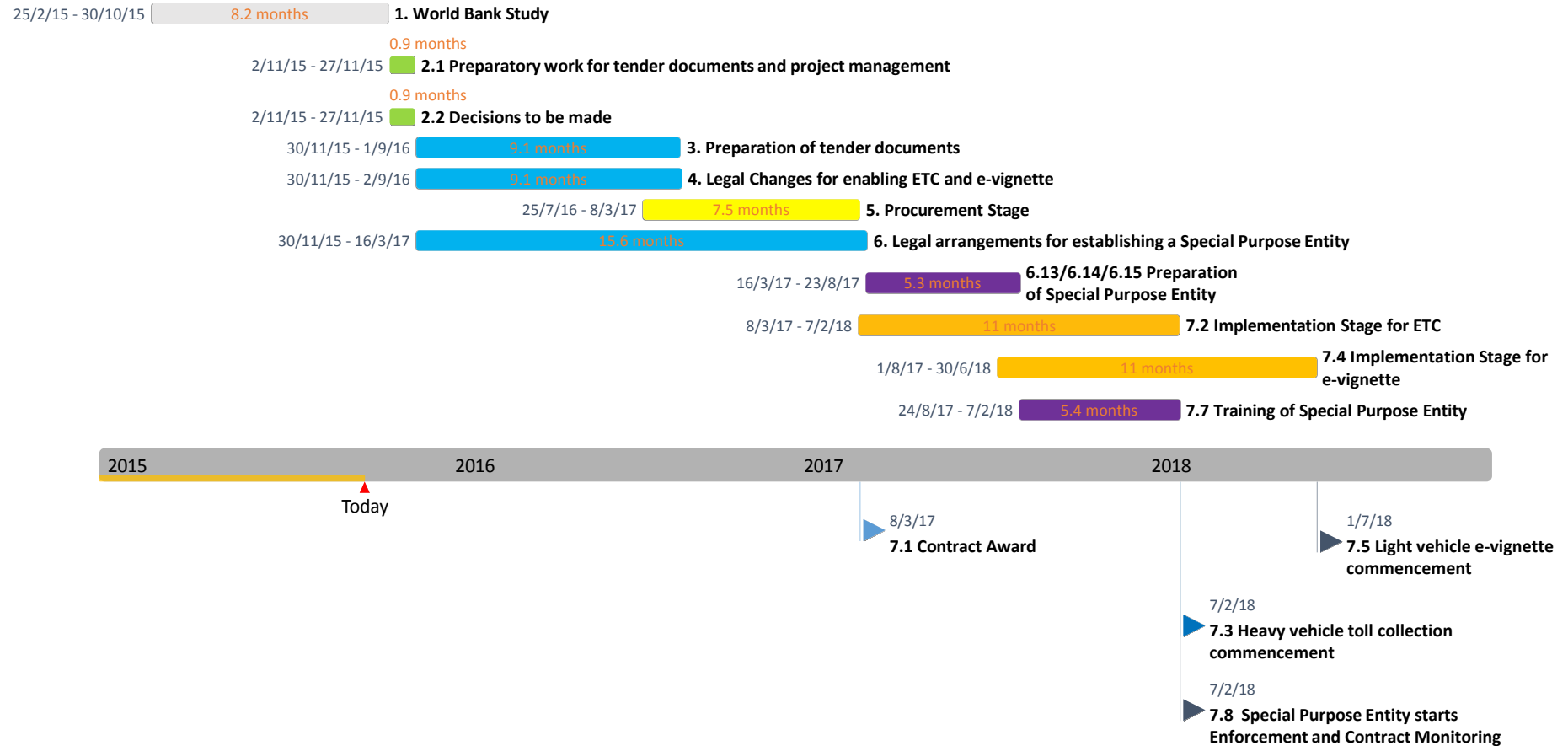


Figure 25. Legislation to Establish an SPE

Tasks and Milestones – Legislation to establish a Special Purpose Entity

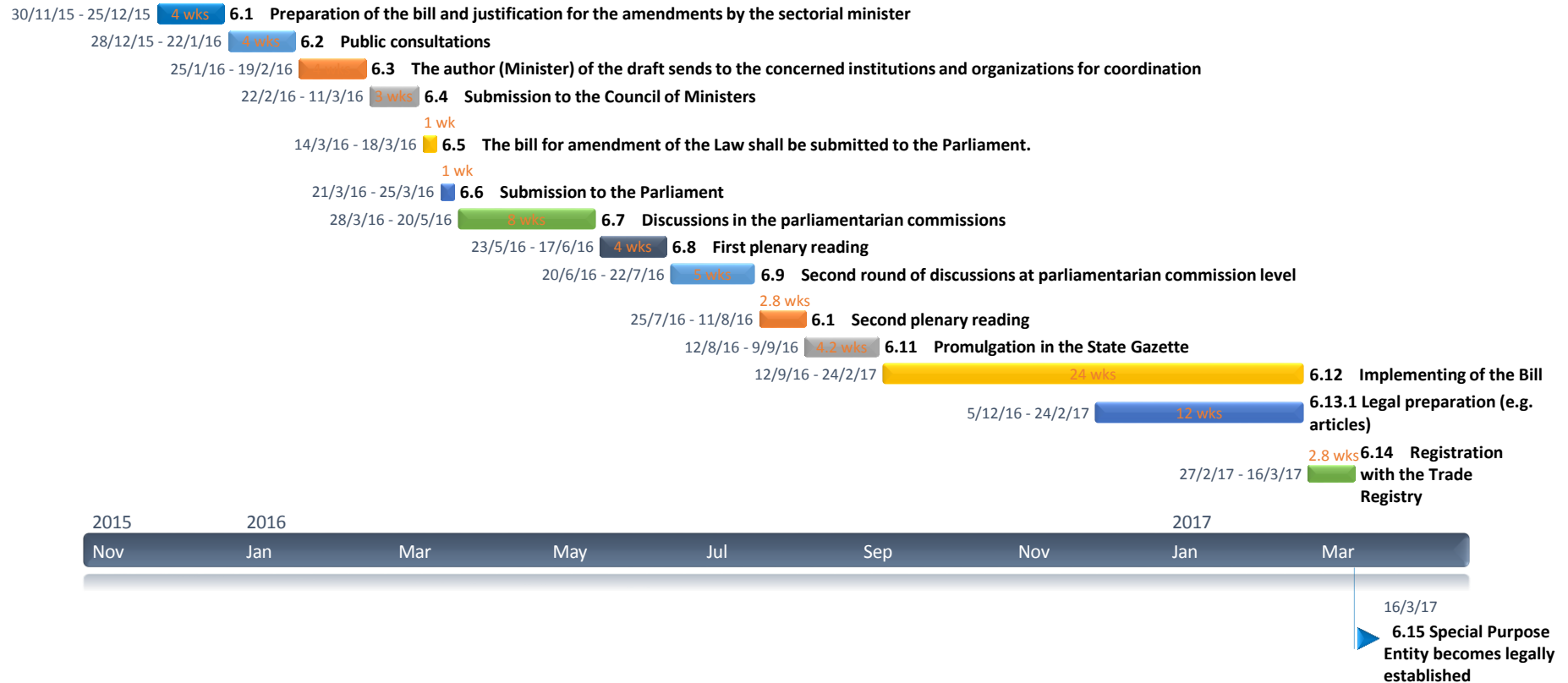


Figure 26. Change of Legislation for ETC and e-vignette

Tasks and Milestones – Change of legislation to enable ETC and e-vignette

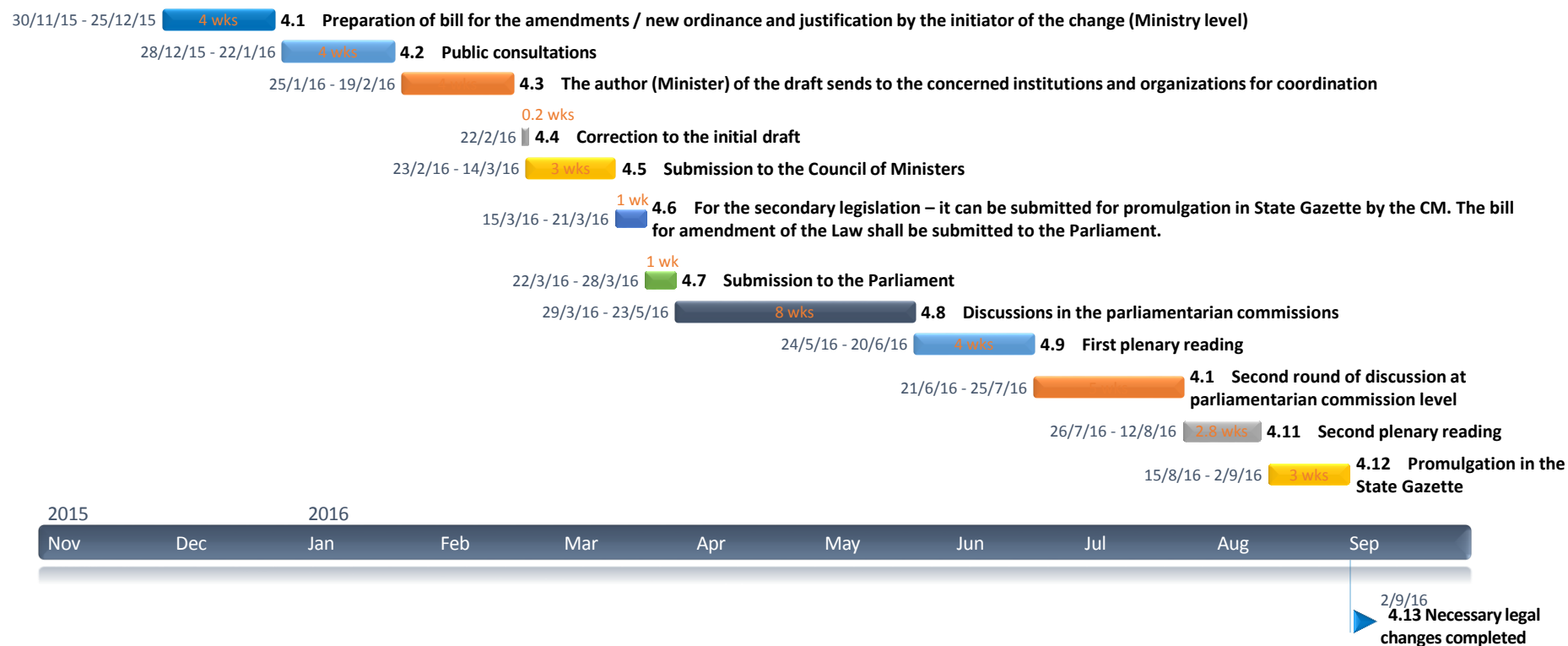
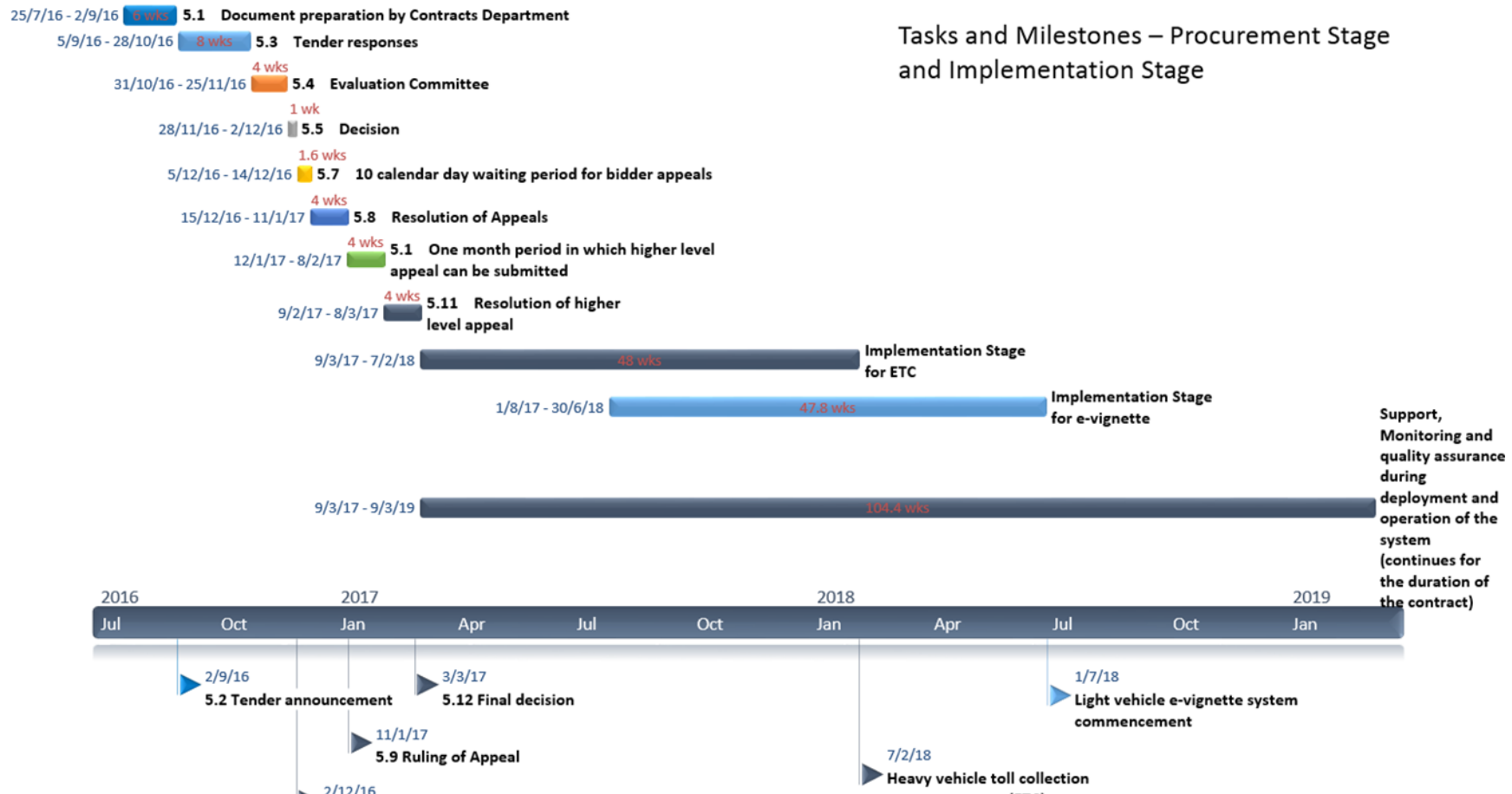


Figure 27. Procurement Process



15 Project Governance and Organization Structure

A Governance Plan and Issue Escalation Process

The Governance Plan identifies the key governance roles and responsibilities for the project and covers who by role, is responsible for:

- Approving project documents,
- Establishing contracts in support of the project,
- Approving contractor deliverables,
- Making the final decision to accept the system and contractor products.

The Executive Steering Committee is the primary entity within this project guiding the governance processes. The Issue Escalation Process identifies the governance and escalation process that will be used to manage issues, problems, change, or approvals.

The project Governance Plan and Issue Escalation Process will be provided as a separate plan and describes the approach and processes to be used for project governance and issue escalation.

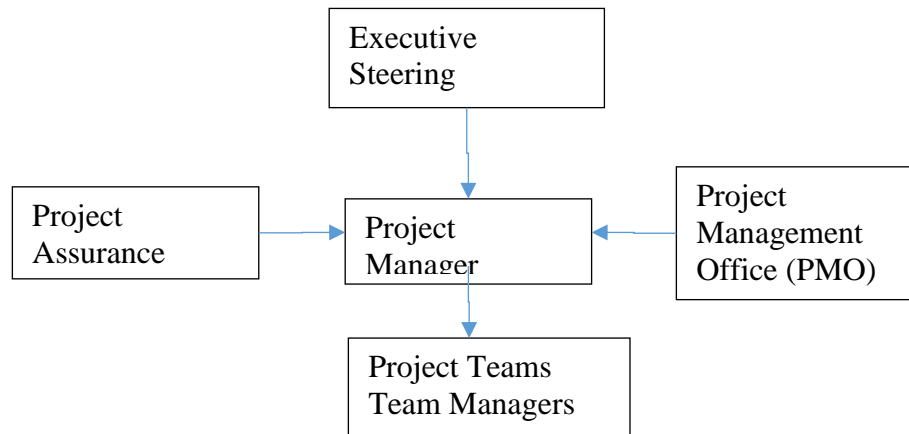
B Project Organizational Structure

The following is a list of internal and external organizations impacted by the project.

- The Special Purpose Entity, if adopted
- RIA
- Ministry of Regional Development
- Ministry of Transport, Information Technologies and Communications
- Ministry of Finance
- Customs
- Police
- Road users including individuals, freight companies, vehicle hire companies, emergency services and national organisations such as the Army
- Media

The proposed project organisation structure is shown in the Figure 28, this must be validated, and participants from the relevant organisations need to be identified at an early stage of the project.

Figure 28. Proposed Project Organization Structure



The roles and responsibilities are as follows:

Executive Steering Committee

The Executive Steering Committee is appointed by the corporate/ programme management to take overall direction of the project. The Executive Steering Committee should be made up of managers with the authority to commit resources to the project within the limits set by the corporate/programme management.

As the public face of the project, the Executive Steering Committee is responsible for any publicity of the project and dissemination of information. The Executive Steering Committee agrees all major plans and should authorise any important changes to the agreed Stage Plans.

On completion, each stage is signed off by the Executive Steering Committee which then must authorise the start of the next stage. Any conflicts within the project or between the project and external bodies are negotiated by the Executive Steering Committee.

The Executive Steering Committee approves the appointment of the Project Manager and any delegation of their responsibilities. Ultimately, the Executive Steering Committee is responsible for the assurance of the project, that it remains on course to deliver the desired outcome of the required quality to meet the Business Case defined in the project contract.

Responsibilities of specific members of the Executive Steering Committee are described below:

Executive

The executive has ultimate responsibility for the success of the project; that it gives ROI and that the demands of the business, user, and supplier are balanced. They will appoint people to the roles of Senior User, Senior Supplier, and Product Manager, will chair meetings, and conduct briefings throughout. The Executive will closely monitor ongoing progress and changes to the project plan; and will eventually approve the notification of project closure once satisfied that it is completed within agreed budgetary and scheduling tolerances.

Senior User

The Senior User specifies the needs of those who will use the product and monitors to ensure the solution will meet those needs. Their place on the board is to represent the interests and requirements of the users as a whole. Sometimes the role may be shared, to cover different user interests, but splitting the role between too many people risks losing effectiveness. The Senior User will ensure that any testing has the appropriate user-focus and representation.

Senior Supplier

The Senior Supplier advises on the technicalities of the project; including method, design, and strategy. They are the product specialists - they approve the product descriptions and represent those who are designing the product, developing it, operating and maintaining it. The Senior Supplier has the authority to utilise any resource needed to achieve the final product. They exercise quality control and must ensure that any operating standards are defined and achieved. They will need to be able to brief other management staff on the technical aspects of the projects.

Here are the definitions of the rest of the project management team:

Project Manager

The Project Manager works on behalf of the Executive Steering Committee to manage the ongoing project to agreed specifications and tolerances. They make sure the final product is as agreed, to the required standard and within time and cost budgets. They are also responsible for ensuring the product will lead to the benefits outlined in the business case.

Team Managers

The Team Managers reports to the Project Manager but have responsibility to ensure the product is delivered in the time and budget specified. They will directly manage the project team and are responsible for motivating and monitoring their ongoing work.

Project Assurance

Executive Steering Committee members are not a part of the project full time and so place a lot of reliance on the Project Manager. They may assign Project Assurance functions to ensure that the project is meeting its aims. Project Assurance is in place to give the board members confidence that they are being given accurate reports on the progress of the project and the expected quality of the output. The task of project assurance is given to individuals from the Executive Steering Committee, but not the project manager or any of the core project team.

Project Management Office

Project support is provided by the Project Management Office and is driven by the needs of the project and the Project Manager. It can take the form of advice on project management tools, administrative services including document management, data collection, project reporting, and monitoring including monitoring of the schedule and financial aspects of the project.

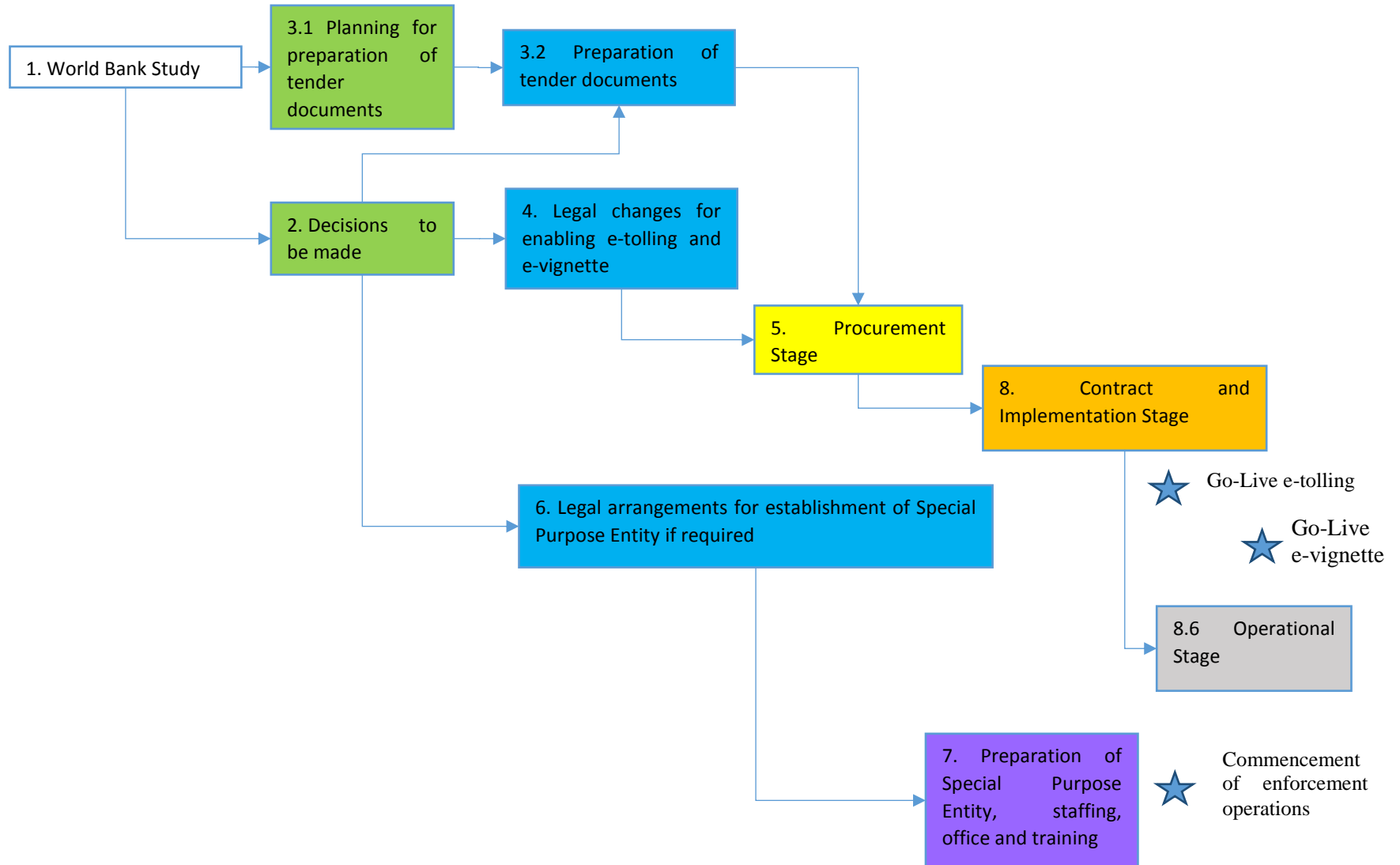
Appendix A: Work Breakdown Structure

The diagram below shows the logical sequence of the main tasks needed to deliver the e-tolling and e-vignette system together with the main milestones.

The numbering of each main task shown in the diagram is the Work Breakdown Structure (WBS) numbering used in the Project Schedule.

The table following the diagram shows all of the tasks and milestones contained in the Project Schedule in a WBS format.

Figure 29. Work Breakdown Structure



| WBS | Task Name |
|------------|--|
| 1 | World Bank Study |
| 2 | Decisions to be made |
| 3 | Preparation of tender documents |
| 3.1 | Preparatory work for tender documents |
| 3.2 | Preparation of tender documents |
| 4 | Legal Changes for enabling e-tolling and e-vignette |
| 4.1 | Preparation of bill for the amendments / new ordinance and justification by the initiator of the change (Ministry level) |
| 4.2 | Public consultations |
| 4.3 | The author (Minister) of the draft sends to the concerned institutions and organizations for coordination |
| 4.4 | Correction to the initial draft |
| 4.5 | Submission to the Council of Ministers |
| 4.6 | For the secondary legislation - it can be submitted for promulgation in State Gazette by the CM. The bill for amendment of the Law shall be submitted to the Parliament. |
| 4.7 | Submission to the Parliament |
| 4.8 | Discussions in the parliamentary commissions |
| 4.9 | First plenary reading |
| 4.10 | Second round of discussion at parliamentary commission level |
| 4.11 | Second plenary reading |
| 4.12 | Promulgation in the State Gazette |
| 4.13 | Necessary legal changes completed |
| 5 | Procurement Stage |
| 5.1 | Document preparation by Contracts Department |
| 5.2 | Tender announcement |
| 5.3 | Tender responses |

| WBS | Task Name |
|----------|---|
| 5.4 | Evaluation Committee |
| 5.5 | Decision |
| 5.6 | Bidders informed |
| 5.7 | 10 calendar day waiting period for bidder appeals |
| 5.8 | Resolution of Appeals |
| 5.9 | Ruling of Appeal |
| 5.10 | One month period in which higher level appeal can be submitted |
| 5.11 | Resolution of higher level appeal |
| 5.12 | Final decision |
| 6 | Legal arrangements for establishing a Special Purpose Entity (if required) |
| 6.1 | Preparation of the bill and justification for the amendments by the sectorial minister |
| 6.2 | Public consultations |
| 6.3 | The author (Minister) of the draft sends to the concerned institutions and organizations for coordination |
| 6.4 | Submission to the Council of Ministers |
| 6.5 | The bill for amendment of the Law shall be submitted to the Parliament. |
| 6.6 | Submission to the Parliament |
| 6.7 | Discussions in the parliamentary commissions |
| 6.8 | First plenary reading |
| 6.9 | Second round of discussions at parliamentary commission level |
| 6.10 | Second plenary reading |
| 6.11 | Promulgation in the State Gazette |
| 6.12 | Implementing of the Bill |
| 6.13 | The establishing of the company after the adoption of the changes has two aspects - organizational and legal. |

| WBS | Task Name |
|------------|--|
| 6.14 | Registration with the Trade Registry |
| 6.15 | Special Purpose Entity becomes operational |
| 7 | Preparation of Special Purpose Entity |
| 7.1 | Recruit senior staff |
| 7.2 | Find offices |
| 7.3 | Establish office and recruit staff |
| 8 | Contract |
| 8.1 | Award of Contract |
| 8.2 | Implementation Stage for e-tolling |
| 8.3 | Go Live of e-tolling |
| 8.4 | Implementation Stage for e-vignette |
| 8.5 | Go-Live for e-vignette |
| 8.6 | Operational Stage by the Contractor for one year |
| 8.7 | Training of Special Purpose Entity |
| 8.8 | Handover operations to Special Purpose Entity |

In addition to the above main tasks, there are several other global tasks that run throughout the period of the project including for example:

- Project and Quality management tasks
- Stakeholder liaison and communication tasks including dialogue with road users, provision of advanced information, road user education etc.

Appendix B: Draft Project Charter

**Project
Project Charter
Version No.<#>
Prepared By: <Name>
Date of Publication: <DD/MM/YYYY>
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B1. Project Overview

This section presents an overview of the reasons why this project is being carried out.

Background

At the request of the Bulgarian Government the World Bank carried out a feasibility study between March and October 2015 for the introduction of electronic toll collection in Bulgaria.

The outcome of the study was that a project should be initiated immediately in order to deliver the necessary systems and operations capability to achieve electronic toll collection by early 2018.

Purpose

The road network in Bulgaria suffers from insufficient funding for maintenance and upgrade. The study carried out by the World Bank identified that implementation of electronic toll collection for heavy vehicles and electronic vignette system for light vehicles would close the funding gap and enable sufficient funding to be achieved to improve the maintenance of roads in Bulgaria.

Description

The project objective is to commence electronic toll collection for heavy vehicles operation in early 2018 which will ensure that toll revenue will flow to the State for the use in maintaining roads.

Pre-Project Documentation:

- World Bank Deliverable 0
- World Bank deliverable 1
- World Bank Deliverable 2

B2. Project Team and Stakeholders

Project Team

Describe the Project team composition; roles, accountabilities; organizational realities; interfaces; communication plan; plan-to-plan; project notebook composition; post-project review positioning.

To be completed during the Project Planning Stage

| Role | Name | Title | Phone |
|--|------|-------|-------|
| Sponsor: <optional description> role | | | |
| Project Manager: <optional role | | | |

| Role | Name | Title | Phone |
|---|------|-------|-------|
| <description> | | | |
| Subject Matter Experts: <optional role description> | | | |
| <Role Name>: <optional role description> | | | |
| <Role Name>: <optional role description> | | | |
| <Role Name>: <optional role description> | | | |
| <Role Name>: <optional role description> | | | |
| <Role Name>: <optional role description> | | | |
| <Role Name>: <optional role description> | | | |

Stakeholder Groups

Describe the stakeholder groups for this project. What do they expect and how do you plan to communicate with them? To be completed during the project planning stage.

| Group Name | Expectations | Specific Requirements | Communication Method |
|---|--------------|-----------------------|----------------------|
| <Group Name>: <description> | | | |
| <Group Name>: <description> | | | |
| <Group Name>: <description> | | | |

| Group Name | Expectations | Specific Requirements | Communication Method |
|--------------------------------|--------------|-----------------------|----------------------|
| <description> | | | |
| <Group Name>: <description> | | | |
| <Group Name>: <description> | | | |

B3. Project Scope

The scope of this project includes the following items:

- Collect tolls from users/owners of vehicles with >3.5T maximum permissible gross vehicle weight using an electronic free flow tolling system on a defined toll road network in Bulgaria
- Collect payments from users/owners of vehicles with < 3.5T maximum permissible gross vehicle weight using an electronic vignette system for vehicles travelling on a defined road network in Bulgaria
- Decommission the existing physical vignette system

The detailed scope of the project is to:

Secure and retain project approval and funding

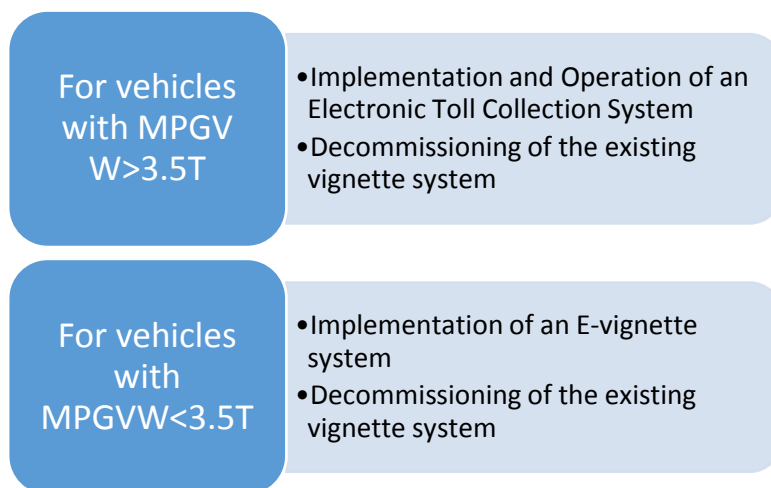
- Define requirements for the project
- Ensure Verification and Validation, and Project Oversight are performed
- Procure one or more Contractors to design, customize, test, implement and carry out operations to deliver the project objectives
- Ensure the Purchaser's organization and staff are prepared for the project implementation
- Decommission the existing vignette system in a phased manner
- Complete the post Implementation and Evaluation Report

The scope of the project does not include:

- Providing functions outside those required
- Collection of tolls on roads not defined as being within the toll road network

The technical scope of project that is the subject of this Project Charter is shown in Figure 30 below.

Figure 30. Technical Scope of the Project



In Scope:

| Objective | Success Criteria | Judge |
|--|--|------------------------------|
| Commence electronic toll collection for heavy vehicles in early 2018 | Toll revenue to be collected, cost of operations, level of compliance by users | Executive Steering Committee |
| Commence electronic vignette for light vehicles in mid 2018 | Vignette revenue to be collected, cost of operations | Executive Steering Committee |

Out of Scope:

- Toll collection or electronic vignette operation on roads other than those to be defined as part of the toll road network

Project Deliverables Planned:

The following main deliverables/products are planned for delivery in this project.

| Deliverable/Product | Approver | Quality Expectation | Date Due |
|---|------------------------------|--|------------------|
| Tender Documents | Executive Steering Committee | Compliance with Public Procurement Law | 1 September 2016 |
| Commencement of operation of an Electronic Toll Collection System | Executive Steering Committee | Compliance with Contract Documents | Early 2018 |
| Commencement of operation of an electronic vignette system | Executive Steering Committee | Compliance with Contract Documents | Mid 2018 |

B4 Project Estimates (Schedule & Cost)

To be completed during the project planning stage

B5. Project Budget

To be completed during the project planning stage

B6. Project Assumptions and Constraints

In order to identify and estimate the required tasks and timing for the project, certain assumptions and premises need to be made. Based on the current knowledge today, the project assumptions are listed below. If an assumption is invalidated at a later date, then the activities and estimates in the project plan should be adjusted accordingly.

B7. Project Assumptions

In order to execute the project and accomplish the project objectives within the time constraints, the following assumptions are made:

- Necessary legislative changes are achieved according to the project schedule
- The necessary project team resources are established in accordance with the project Resource Plan
- The project governance structure is established and functions efficiently making decisions quickly in order to avoid delays
- Risk allocation is done in an optimal manner allocating risks to the organization best placed to manage them
- The potential Contractor (or Contractors) has a developed system that contains the majority of the components to satisfy the business requirements.
- All relevant stakeholders will be properly engaged in accordance with the project Communication Plan

B8. Project Constraints

The major constraints facing the project are:

- The requirement to commence toll collection for vehicles >3.5T maximum permissible gross vehicle weight by early 2018
- The Public Procurement Law and the procedure for procurement
- The need for a credible, efficient and cost effective enforcement body or bodies
- Obtaining funding for each major stage of the project
- The EU Directive regarding the European Electronic Toll Service (EETS) in terms of interoperability requirements

B9. Project Risks

Project risks are circumstances or events that exist outside of the control of the project team and will have an adverse impact on the project if they occur.

To be completed during the project planning stage

B10. Project Decision-Making

The Project Manager has the following authority with respect to:

- Hiring & Firing (staff acceptance) -
- Budgetary Decisions -
- Technical Decisions –
- Conflict Resolution –

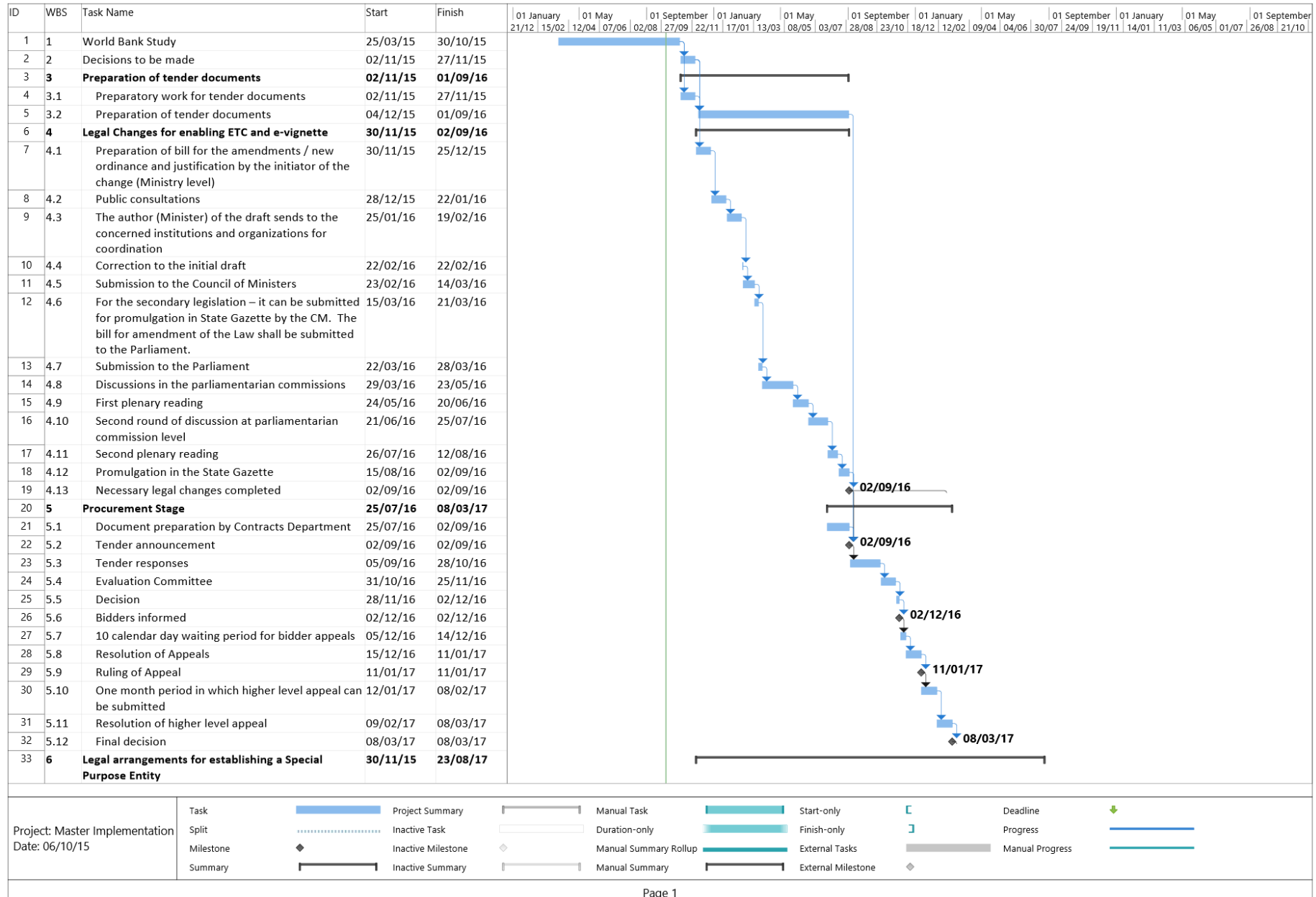
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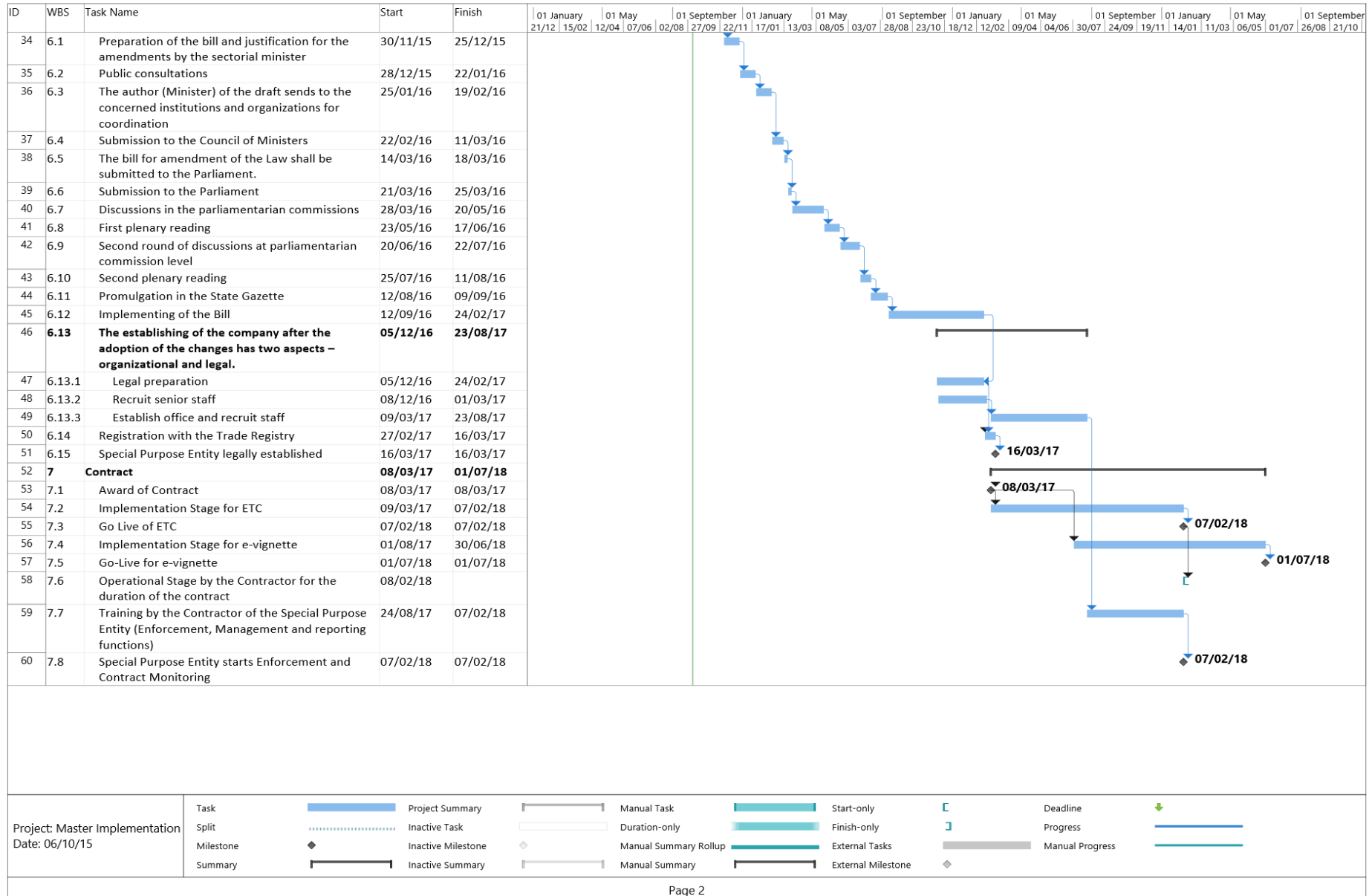
Beyond these levels of authority, the path of escalation is to the executive Steering Committee.

B11. Project Approvals:

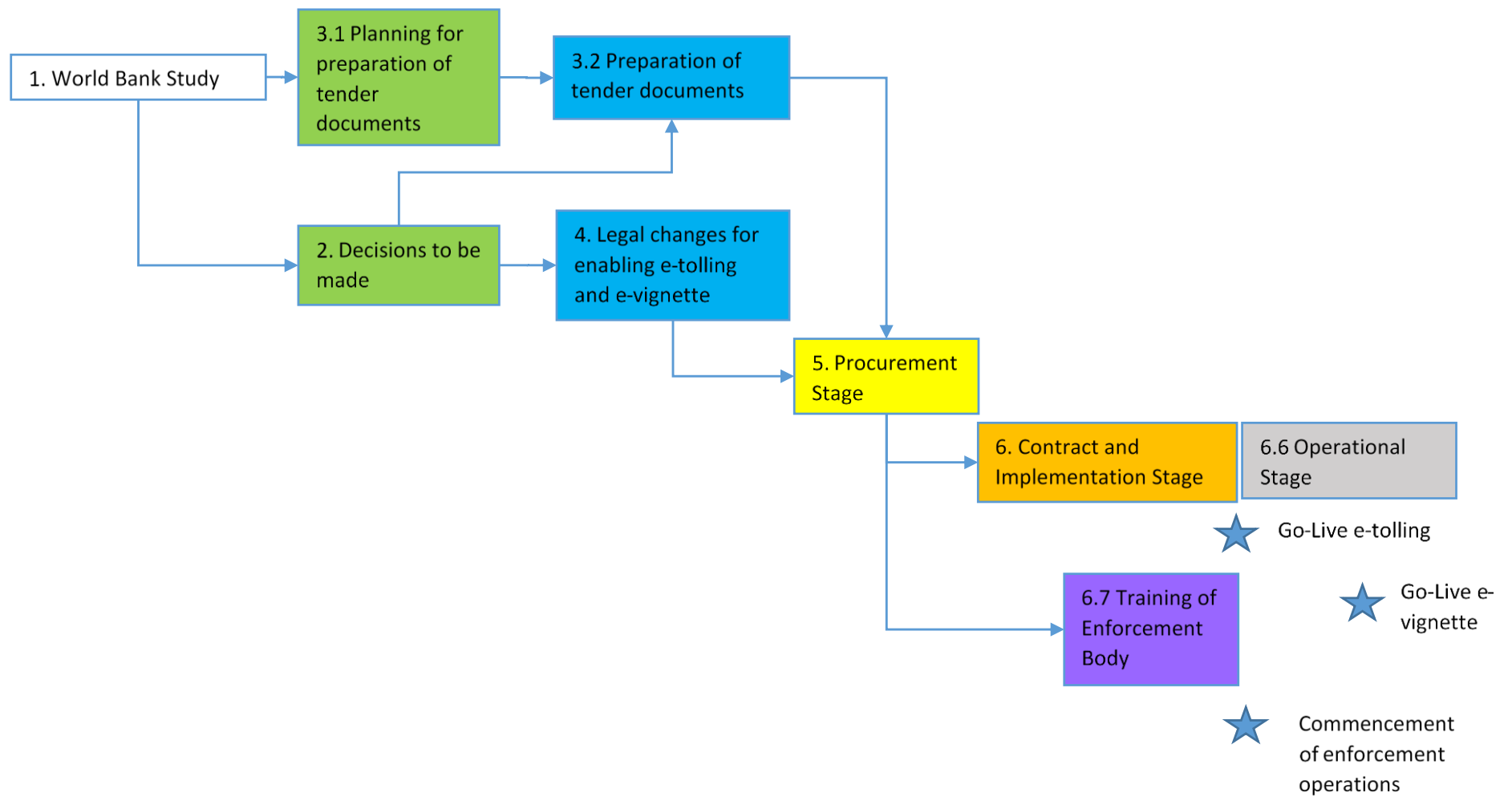
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Appendix C: Project Schedule

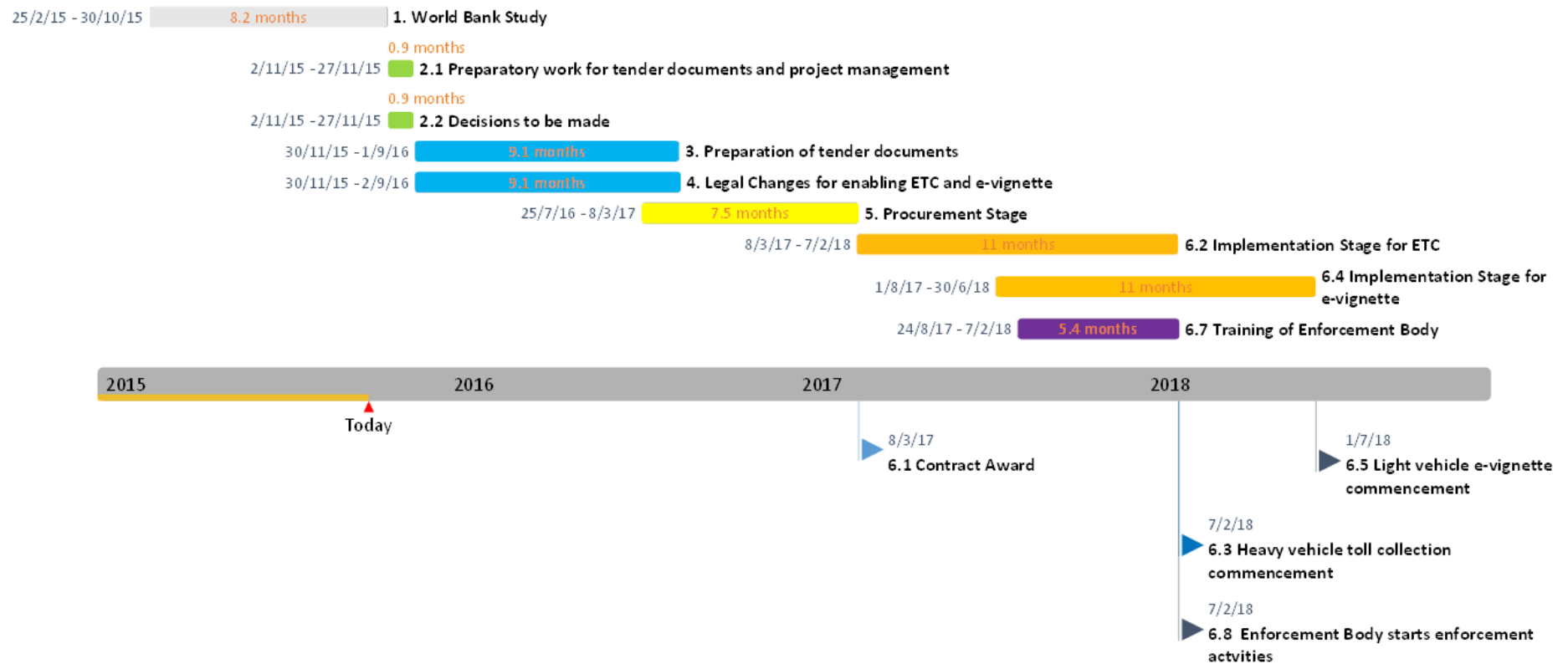


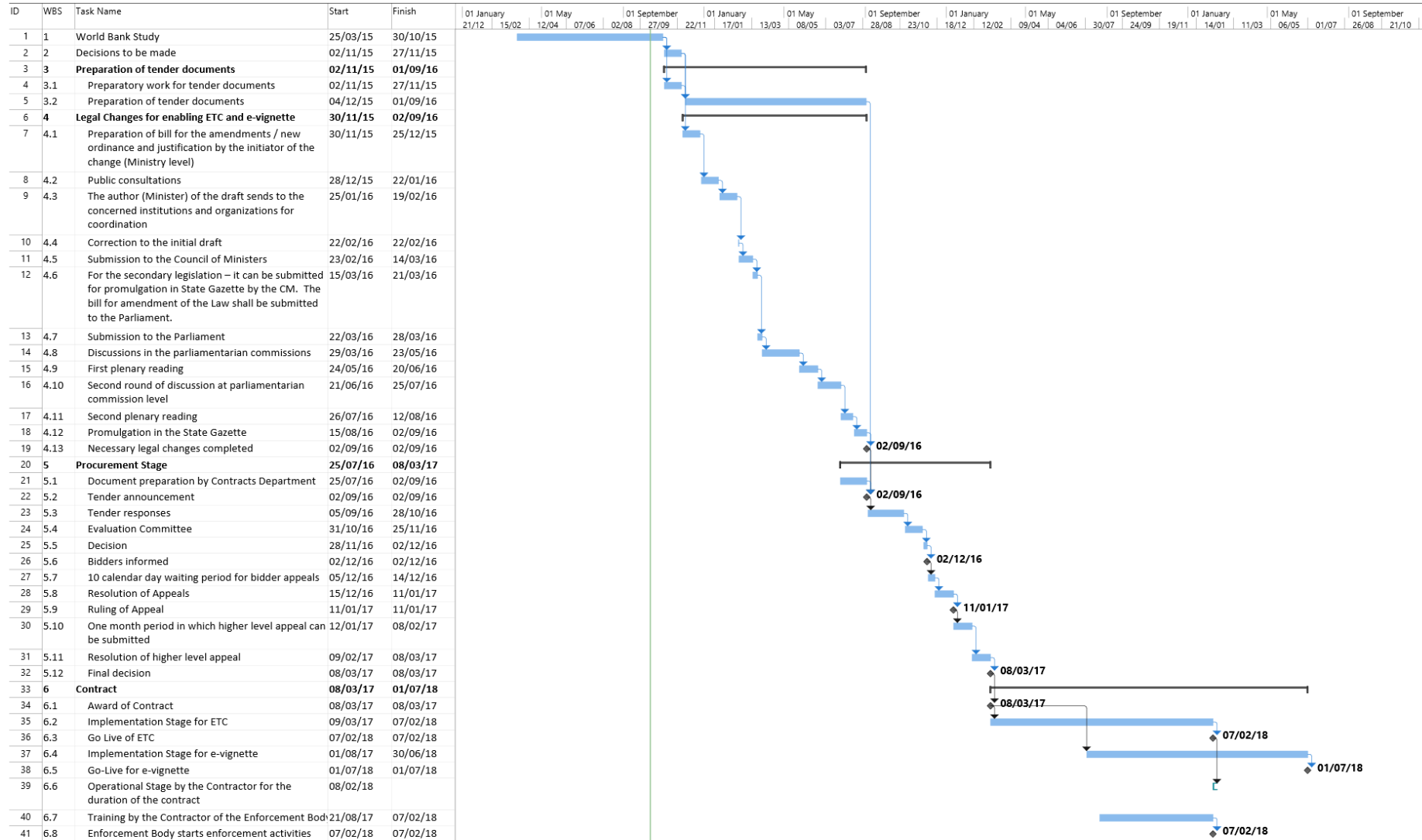


Program without Special Entry



Main Tasks and Milestones – Overall Project Schedule





| | | | | | | | | | | |
|--|-----------|--|--------------------|--|-----------------------|--|--------------------|--|-----------------|--|
| Project: Master Implementation Date: 12/10/15 | Task | | Project Summary | | Manual Task | | Start-only | | Deadline | |
| | Split | | Inactive Task | | Duration-only | | Finish-only | | Progress | |
| | Milestone | | Inactive Milestone | | Manual Summary Rollup | | External Tasks | | Manual Progress | |
| | Summary | | Inactive Summary | | Manual Summary | | External Milestone | | | |

Chapter 3: Financial Analysis

16 Introduction

A The Structure of Deliverable 3

This is Part 3 of Deliverable 2 of the project for “Development of a Comprehensive Vision for the Introduction of the Electronic System for Provision of the European Electronic Toll Services”.

The background to the project is given in Part 1 of this Deliverable 2, while part 2 contains a Master Implementation Plan.

This Part 3 meets the Terms of Reference requirement for analysis of the financial impact for the introduction of the system on road infrastructure projects already approved and in progress (financed by the EU Cohesion Fund), with a view to possible revenue generation.

It addresses the following ToR requirements:

- Identification of national routes or road sections for which it will apply.
- Development of a preliminary financial model (flows of investment / costs / revenues, distribution of assets and liabilities, rules and frameworks for payment, etc.)
- An estimate of revenues from the toll collection by classes of network and categories of vehicles for a period of 5-10 years
- Development of preliminary financial plan for a forecasted / anticipated period of return on investment in terms of developing the electronic system for the provision of EETS

B Targets for revenue

The net levels of net revenue targeted were researched and defined in Deliverable 1 as at least 400 Mio BGN per annum. However, this must be achieved:

- Without diversion of traffic to free unsuitable roads due to elasticity in payment of tolls
- Fairly, with a minimum of impact on users both private and in fleets
- With a minimum of risk
- Flexibly, for example with the ability to fine tune tolling rates or roads covered

Hence this report examines many scenarios for example of reduced e-tolling and e-vignette rates to minimize impact, and different road networks. We present these as options for government choice taking other factors such as public acceptability into account, rather than a single option. These can then be used for Government to make trade-offs of light and vehicle prices and network coverage.

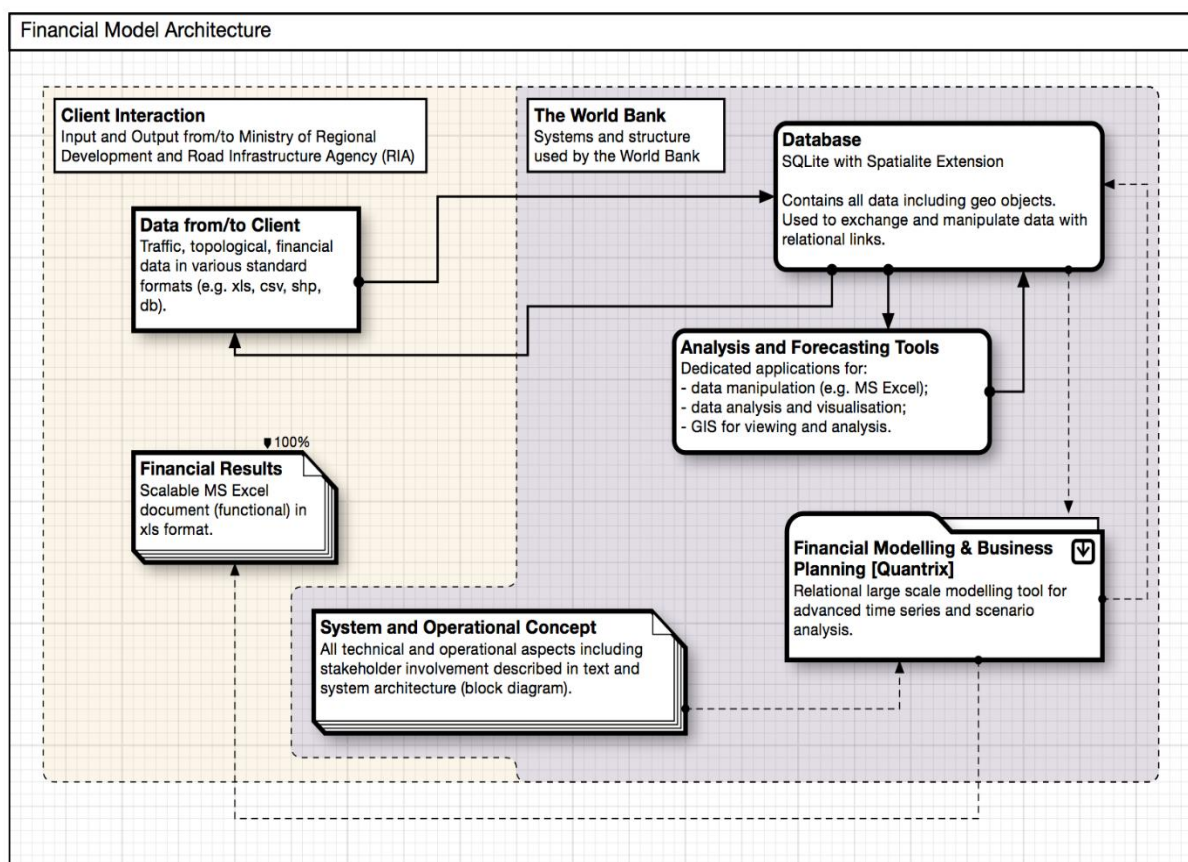
17 Financial Model Architecture

This chapter describes the financial model to evaluate revenues and costs for strategic options chosen in deliverable 1. The objective is to provide evidence of revenues and costs for the further deployment of a solution for e-tolling and e-vignettes in Bulgaria.

The tools used allow efficient scenario development and ad hoc “what if” analysis, while still being flexible to grow with the project in its future stages (e.g. procurement and implementation). At this stage the financial model developed contains 33 matrices (i.e. multi-dimensional tables), about 300 equations and 9.5 Mio. Input, and output cells.

Figure 31 shows the architecture of the modelling environment that has been adopted.

Figure 31. Financial Model Architecture



The left side of the diagram (orange area) shows the client side data provision, while the right side (violet) shows the World Bank systems involved in the financial modelling. Data and information flows between the client and the World Bank systems. These provide:

- Analysis (data, network, existing best-practice in e-tolling and e-vignette systems, etc.),
- Synthesis (system and operational concept with revenue generation and cost modelling assumptions, etc.) and
- Processing (geodata generation, data queries, financial modelling and processing, etc.)

The financial model has a geodata centric modelling approach. That means that each revenue and cost item is whenever practical broken down to actual road sections. Each road section is linked through a distinct ID to geographical vector data for mapping on any Geographical Information System (GIS).

As shown in the figure, all data is run through a SQLite database¹ with the Spatialite extension² to ensure data consistency and quality. Dedicated data analysis and synthesis is done using software packages such as MS Excel, Quantum GIS (QGIS)³ and others.

The financial modelling and business planning activities and processing are then done using a relationally structured, multi-dimensional modelling software called “Quantrix”⁴. The system enables “hyper-cube oriented” large data and multiple scenario modelling, processing and analysis.

All qualitative and quantitative results are available in either a text report or in standard data format such as MS Excel or comma separated value (CSV) files.

18 Financial Model

A Modules

The financial model consists of the following modules:

- Traffic,
- Road Network,
- Pricing (weight and emissions),
- Vehicles,
- Vignettes,
- System Cost and Operational Assumptions,
- Revenue and Cost Processing,
- Results.

Figure 32 shows the structure of the financial model and the modules with data flows

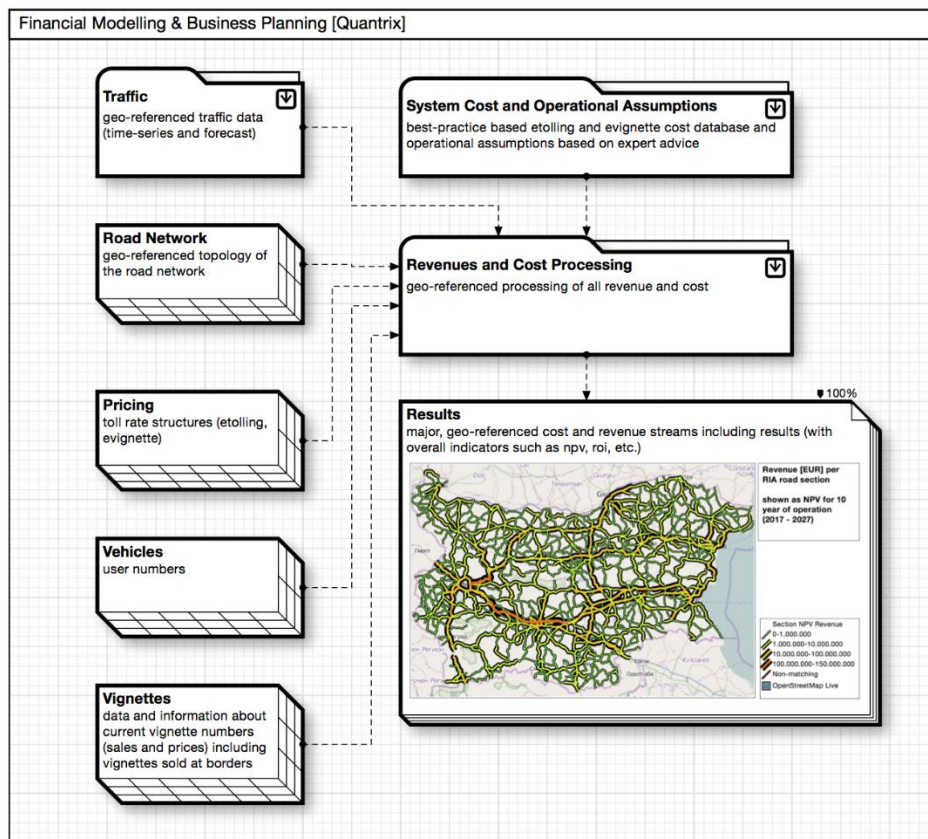
¹ SQLite is a relational database management system contained in a C programming library. In contrast to many other database management systems, SQLite is not a client-server database engine. Rather, it is embedded into the end program: <https://en.wikipedia.org/wiki/SQLite>, <http://sqlite.org>

² Spatialite is a software extension under a MPL GPL LGPL tri-license (i.e. open source) that enables the well-known lightweight DBMS SQLite to process GIS and spatial data: <https://en.wikipedia.org/wiki/Spatialite>, <https://www.gaia-gis.it/gaia-sins/index.html>

³ QGIS (previously known as "Quantum GIS") is a cross-platform free and open-source desktop geographic information system (GIS) application that provides data viewing, editing, and analysis capabilities: <http://qgis.org/en/site/>

⁴ Further information about the system can be found at: <http://www.quantrix.com/en/products/quantrix-modeler/>

Figure 32. Financial Modelling/ Modelling



B Traffic Module:

The traffic module is one of the core modules of the financial model. Based on the average annual daily traffic (AADT) 2015 traffic count estimation the AADT for the years 2016 to 2027 is forecasted using an estimate for the Bulgarian Gross Domestic Product (GDP) of 2.5% which is:

- Adapted for regional differences with regional GDP factors (adopting the NUTS2 structure⁵) and
- Traffic to GDP elasticity for heavy (factor = 1) and light vehicles (factor = 1.25).

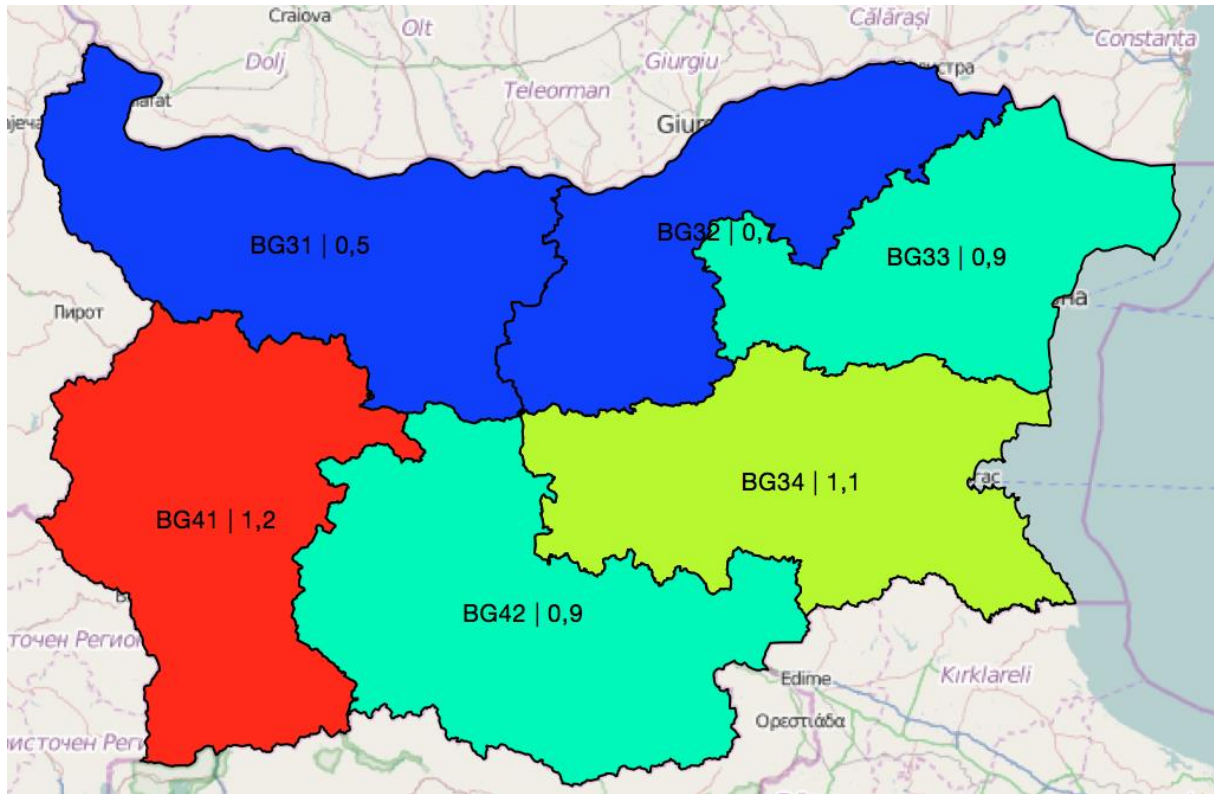
The NUTS 2 regional factors used are:

- BG31: 0.50
- BG32: 0.70
- BG33: 0.90
- BG34: 1.10
- BG41: 1.20
- BG42: 0.90

⁵ See: <http://ec.europa.eu/eurostat/web/nuts/overview>.

Error! Reference source not found.33 shows the geographical distribution of the NUTS2 regions and regional GDP factors.

Figure 33. Regional GDP Factors Used to Modulate the Bulgarian GDP Estimate Per NUTS2 Region



The equation used to estimate the AADT 2016 to 2027 is,

$$\begin{aligned}
 AADT(section)_{t,region,vehicle\ category} &= AADT(section)_{2015} * \emptyset GDP_t * gdp\ Faktor_{region} \\
 &\quad * traffic\ to\ GDP\ elasticity_{vehicle\ category} * emission\ ratio_t
 \end{aligned}$$

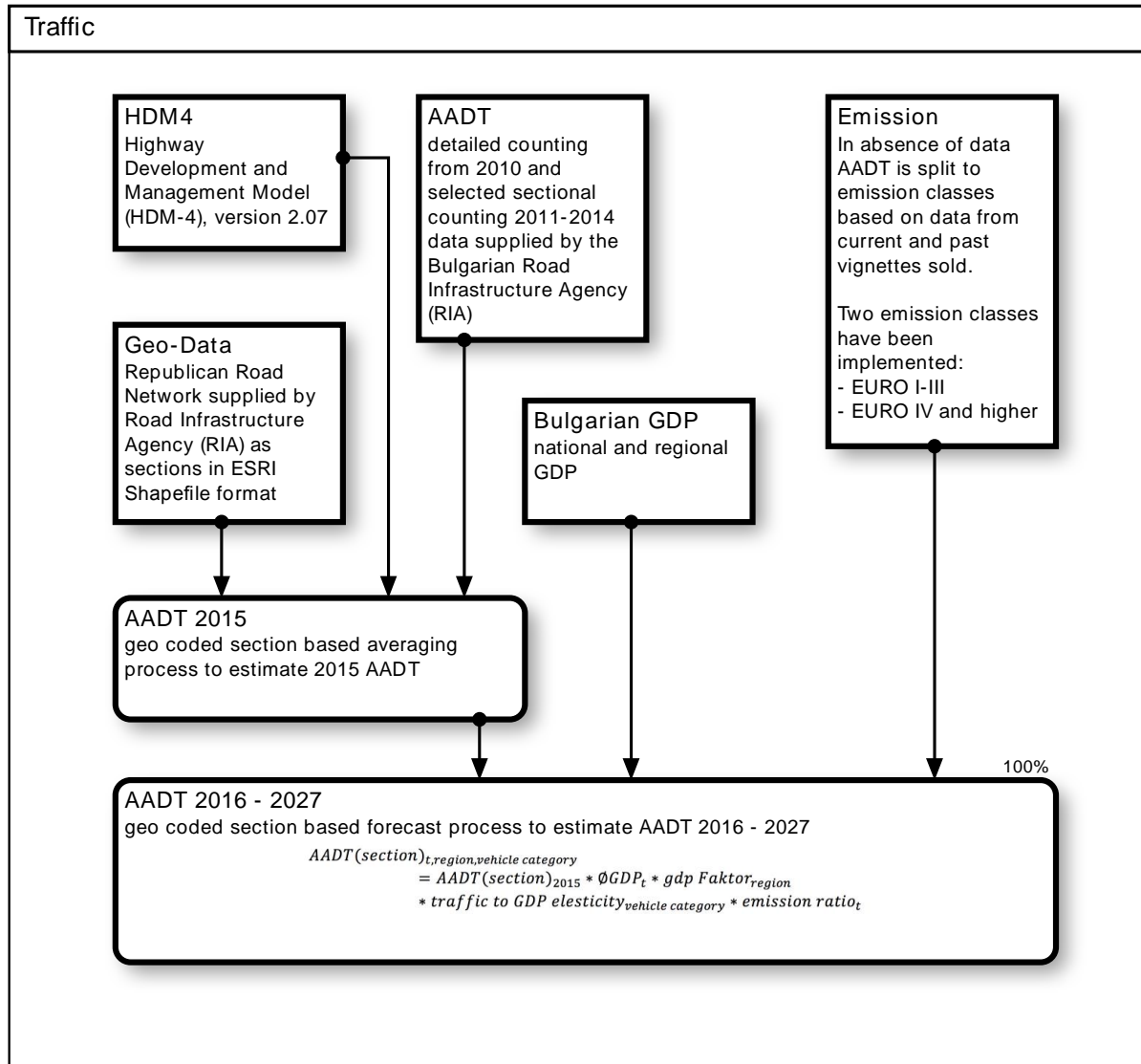
for each road section with

- t being the time index 2016 to 2027,
- $region$ being the index to the NUTS2 regions,
- $vehicle\ category$ being the index for light and heavy vehicles, and
- $\emptyset GDP$ being the average gross domestic product for Bulgaria,
- $gdp\ Faktor$ being a factor accounting for regional GDP differences,
- $traffic\ to\ GDP\ elasticity$ being a correlation between GDP and traffic development,
- $emission\ ratio$ being the split ratio for AADT based on vignette data (see Vignette Module).

Based on the geo information received from RIA, new motorway constructions (as new sections) have been added (motorways constructed and opened in 2015). We have been informed by the Ministry that no other major projects should be taken into account in the near future that is subject to e-tolling.

The estimated AADT per section has been totalled by year and e-tolling network scenario. **Error! Reference source not found.** shows the process and data resources used to estimate AADT 2016 to 2027.

Figure 34. Traffic Estimation Process



Traffic diversion induced by the introduction of e-tolling has been taken into account as follows:

From pricing changes in the current vignette system introduced in the year 2013, it is evident that commercial truck users are very sensitive to pricing changes and will adopt the most economical solution for their transport needs. In an e-tolling scheme, many users will pay substantially more than for a vignette. These users will be keen to use the most economical routes and will divert to non tolled roads where possible. The diversion is highly dependent on the e-tolling rate structure and pricing levels and the availability of suitable evasion routes.

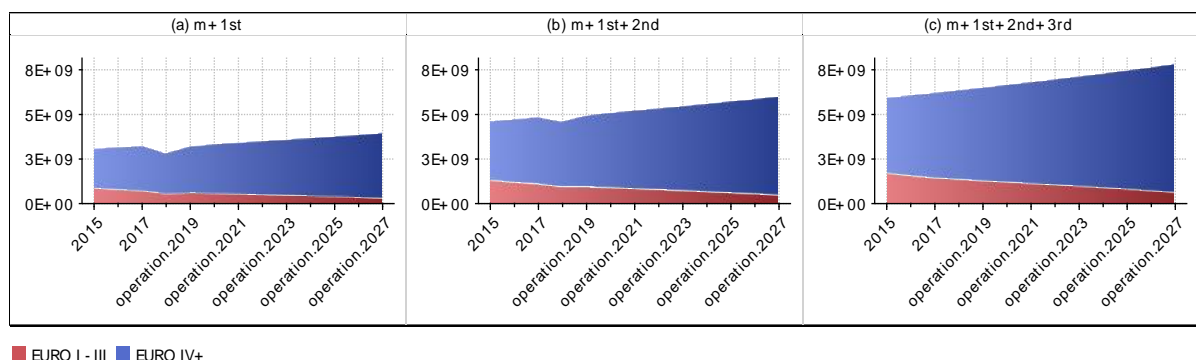
In absence of data about Bulgarian user behaviour with the introduction of e-tolling⁶ but based on e-tolling experience in other countries we have implemented the following diversion logic:

- We assume that diversion will be higher initially but decreases asymptotically (in other words flattens out) to a residual diversion percentage within the first few years, as users get used to e-tolling.
- In the road network scenarios defined, we assume that larger trucks are less likely to divert to lower class roads because of vehicle characteristics and diminishing economic benefit.
- Thus, in the model we assume the following values per network scenario:
 - Motorway + 1st class roads:
 - Trucks ≥ 12 tons: diversion initially 7% and after 3 years approx. 2%
 - Trucks < 12 tons: diversion initially 20% and after 3 years approx. 5%
 - Motorway + 1st + 2nd class roads:
 - Trucks ≥ 12 tons: diversion initially 3% and after 3 years approx. 0%
 - Trucks < 12 tons: diversion initially 10% and after 3 years approx. 3%
 - Motorway + 1st + 2nd + 3rd class roads:
 - No diversion because there are hardly any roads suitable for trucks

Error! Reference source not found. shows the estimated total traffic (in total kilometres driven per year) for each road network scenario divided by the emission classes with assumed traffic diversion with the introduction of e-tolling in 2018.

Traffic diversion results in a drop in traffic with the introduction of e-tolling on different road network combinations. As visible in figure 35, the highest relative drop in traffic numbers will be in a motorway + 1st class road scenario. In absence of effective alternative routes suitable for trucks, we anticipate no substantial diversion in a motorway + 1st + 2nd + 3rd class road network scenario.

Figure 35. Traffic (Total Annual km Driven) Per Network Scenario Divided by Emission Classes



⁶ A user behaviour survey was beyond the scope of this project.

Error! Reference source not found.35 also shows the trend to “cleaner” vehicles through differential pricing (“cleaner” vehicles pay less) realised through the current vignette and kept in an e-tolling scenario.

C Road Network Module:

The road network module contains the geo-referenced (based on section IDs) road data categorised into road classes, regions, NUTS2, NUTS3, lane numbers and section lengths. At present, the road database contains the current road network including roads under construction and to be finished in 2015.

Through the section IDs and NUTS categorisations, further data such as information about the road conditions and maintenance, economic indicators or other socio-economic indicators can be directly linked to e-tolling or e-vignettes.

The table in **Error! Reference source not found.**36 shows the structure of the road network module data and a few rows of data as an example.

Figure 36. Road Network Data Table

| | ROAD_ID | Length_m_c | Length_m_r | Lanes_no_ | RoadClass | Region | Region_Nar | NUTS3 | NUTS2 | Length_km | av_GDP_growth% | reg GDP factor |
|------|---------|------------|------------|-----------|-----------|--------|------------|-------|-------|-----------|----------------|----------------|
| 1/10 | 1 | 19783 | | 4 | I | 5 | Vidin | BG311 | BG31 | 19,783 | 2,5 | 0,5 |
| 1/11 | 1 | 10967 | | 2 | I | 5 | Vidin | BG311 | BG31 | 10,967 | 2,5 | 0,5 |
| 1/12 | 1 | 13984 | | 2 | I | 5 | Vidin | BG311 | BG31 | 13,984 | 2,5 | 0,5 |
| 1/13 | 1 | 18024 | | 2 | I | 5 | Vidin | BG311 | BG31 | 18,024 | 2,5 | 0,5 |
| 1/14 | 1 | 10784 | | 2 | I | 5 | Vidin | BG311 | BG31 | 10,784 | 2,5 | 0,5 |
| 1/20 | 1 | 14585 | | 2 | I | 11 | Montana | BG312 | BG31 | 14,585 | 2,5 | 0,5 |
| 1/21 | 1 | 13005 | | 2 | I | 11 | Montana | BG312 | BG31 | 13,005 | 2,5 | 0,5 |
| 1/22 | 1 | 8488 | | 2 | I | 11 | Montana | BG312 | BG31 | 8,488 | 2,5 | 0,5 |
| 1/23 | 1 | 8546 | | 3 | I | 11 | Montana | BG312 | BG31 | 8,546 | 2,5 | 0,5 |
| 1/24 | 1 | 7284 | | 2 | I | 11 | Montana | BG312 | BG31 | 7,284 | 2,5 | 0,5 |
| 1/30 | 1 | 9021 | | 3 | I | 6 | Vratsa | BG313 | BG31 | 9,021 | 2,5 | 0,5 |
| 1/31 | 1 | 10994 | | 2 | I | 6 | Vratsa | BG313 | BG31 | 10,994 | 2,5 | 0,5 |
| 1/32 | 1 | 14825 | | 4 | I | 6 | Vratsa | BG313 | BG31 | 14,825 | 2,5 | 0,5 |
| 1/33 | 1 | 15310 | | 2 | I | 6 | Vratsa | BG313 | BG31 | 15,31 | 2,5 | 0,5 |
| 1/40 | 1 | 13250 | | 2 | I | 21 | Sofia | BG412 | BG41 | 13,25 | 2,5 | 1,2 |
| 1/41 | 1 | 12150 | | 2 | I | 21 | Sofia | BG412 | BG41 | 12,15 | 2,5 | 1,2 |
| 1/42 | 1 | 19085 | | 2 | I | 21 | Sofia | BG412 | BG41 | 19,085 | 2,5 | 1,2 |
| 1/43 | 1 | 22301 | | 2 | I | 21 | Sofia | BG412 | BG41 | 22,301 | 2,5 | 1,2 |
| 1/44 | 1 | 4248 | | 4 | I | 21 | Sofia | BG412 | BG41 | 4,248 | 2,5 | 1,2 |
| 1/47 | 1 | 9740 | | 4 | I | 21 | Sofia | BG412 | BG41 | 9,74 | 2,5 | 1,2 |
| 1/50 | 1 | 11030 | | 4 | I | 13 | Pernik | BG414 | BG41 | 11,03 | 2,5 | 1,2 |
| 1/51 | 1 | 20285 | | 4 | I | 13 | Pernik | BG414 | BG41 | 20,285 | 2,5 | 1,2 |
| 1/60 | 1 | 7992 | | 3 | I | 9 | Kvustendil | BG415 | BG41 | 7,992 | 2,5 | 1,2 |

D Pricing Module:

This module holds the baseline rates tables for e-tolling and the e-vignettes. The pricing module is linked to the revenue and cost processing modules.

Based on discussions with the government, three e-tolling pricing scenarios have been implemented:

- **“GOV recommended rates (av. BGN 0.2)”**: This is the e-tolling baseline scenario based on Government recommended e-tolling rates and an average price of BGN 0.2 per kilometre with the following structure:
 - Cleaner vehicles (EURO II - V and better) pay less than dirtier vehicles (EURO I - II).
 - Motorway and 1st class roads are more expensive except for heavy and articulated trucks which pay more for 3rd class roads.

- Prices increase with the weight of the vehicle.
- **“60% of GOV recommended rates (av. BGN 0.12)”**: As a second scenario, we have modelled gross e-tolling revenue with 40% lower rates as compared to the government recommended rates but with the same pricing structure.
- **“130% of GOV recommended rates (av. BGN 0.26)”**: As a third scenario, we have modelled gross e-tolling revenue with 30% higher rates as compared to the government recommended rates but with the same pricing structure.

The table in **Error! Reference source not found.**³⁷ shows the three e-tolling pricing scenarios and e-tolling rates by vehicle type, road, and emission class in BGN.

Figure 37. E-tolling Rates Table

| | Bus | | Small Truck | | Medium Truck | | Heavy Truck | | Articulated Truck | |
|--|-------------|---------------|-------------|---------------|--------------|---------------|-------------|---------------|-------------------|---------------|
| | EURO I – II | EURO III – V+ | EURO I – II | EURO III – V+ | EURO I – II | EURO III – V+ | EURO I – II | EURO III – V+ | EURO I – II | EURO III – V+ |
| GOV recommended rates (av. BGN 0.2) | | | | | | | | | | |
| M | 0.22 | 0.17 | 0.18 | 0.14 | 0.22 | 0.17 | 0.26 | 0.20 | 0.33 | 0.26 |
| I | 0.22 | 0.17 | 0.18 | 0.14 | 0.22 | 0.17 | 0.26 | 0.20 | 0.33 | 0.26 |
| II | 0.18 | 0.14 | 0.15 | 0.11 | 0.18 | 0.14 | 0.26 | 0.20 | 0.33 | 0.26 |
| III | 0.14 | 0.11 | 0.11 | 0.08 | 0.14 | 0.11 | 0.34 | 0.26 | 0.39 | 0.30 |
| 60% of GOV recommended rates (av. BGN 0.12) | | | | | | | | | | |
| M | 0.13 | 0.10 | 0.11 | 0.08 | 0.13 | 0.10 | 0.16 | 0.12 | 0.20 | 0.15 |
| I | 0.13 | 0.10 | 0.11 | 0.08 | 0.13 | 0.10 | 0.16 | 0.12 | 0.20 | 0.15 |
| II | 0.11 | 0.08 | 0.09 | 0.07 | 0.11 | 0.08 | 0.16 | 0.12 | 0.20 | 0.15 |
| III | 0.08 | 0.06 | 0.06 | 0.05 | 0.08 | 0.06 | 0.21 | 0.16 | 0.24 | 0.18 |
| 130% of GOV recommended rates (av. BGN 0.26) | | | | | | | | | | |
| M | 0.28 | 0.22 | 0.23 | 0.18 | 0.28 | 0.22 | 0.34 | 0.26 | 0.43 | 0.33 |
| I | 0.28 | 0.22 | 0.23 | 0.18 | 0.28 | 0.22 | 0.34 | 0.26 | 0.43 | 0.33 |
| II | 0.23 | 0.18 | 0.19 | 0.15 | 0.23 | 0.18 | 0.34 | 0.26 | 0.43 | 0.33 |
| III | 0.18 | 0.14 | 0.14 | 0.11 | 0.18 | 0.14 | 0.45 | 0.34 | 0.51 | 0.39 |

As discussed with RIA and recommended for Ministerial approval, the pricing strategy suggested is that heavy and articulated trucks are charged a flat rate for motorway, 1st and 2nd class roads but a higher rate for 3rd class roads to encourage them to use roads better suited for heavy weight vehicles.

Buses, Small Trucks and Medium Trucks pay the same rate for motorway and 1st class roads, while paying less for 2nd and 3rd class roads.

These principles are kept while varying the tariffs in three rating scenarios.

Ways of detecting and classifying these vehicles on the road are detailed in Part 1.

Two e-vignette pricing scenarios have been implemented

- **“e-vignette rate option 1”**: In this e-vignette scenario, a rather high price increase for the annual e-vignette (from 67 BGN to 150 BGN) but the same pricing as the current weekly and monthly vignettes is modelled.
- **“e-vignette rate option 2”**: In this e-vignette scenario, the annual vignette price is only moderately raised from the current level (from 67 BGN to 97 BGN). The same pricing is kept for the current weekly and monthly vignettes.

The table in **Error! Reference source not found.**³⁸ shows the two e-vignette, pricing scenarios and rates in BGN.

Figure 38. E-vignette Rates Table

| | operation | | |
|--------------------------|----------------|---------|--------|
| | 2018 | | |
| | Light Vehicles | | |
| | Category 3 | | |
| | weekly | monthly | annual |
| e vignette rate option 1 | 10 | 25 | 150 |
| e vignette rate option 2 | 10 | 25 | 97 |

Compared to international e-tolling and e-vignette practices (data taken in April 2015) the Bulgarian rates for all scenarios modelled are in the lower half. **Error! Reference source not found.**³⁹ and **Error! Reference source not found.**⁴⁰ give a tabular overview how Bulgarian rates compare to other toll domain rates (green means lower rates, red higher rates). Note that Germany has recently reviewed its rates.

Figure 39. International Comparison of e-tolling Rates

| | GOV recommended rates (av. BGN 0.2) | | | 60% of GOV recommended rates (av. BGN 0.12) | | | 130% of GOV recommended rates (av. BGN 0.26) | | |
|-----------------|-------------------------------------|-------------|-------------|---|-------------|-------------|--|-------------|-------------|
| | Medium and Heavy Truck Types | | | Medium and Heavy Truck Types | | | Medium and Heavy Truck Types | | |
| | Medium | Heavy | Articulated | Medium | Heavy | Articulated | Medium | Heavy | Articulated |
| Austria | 0.38 | 0.53 | 0.79 | 0.38 | 0.53 | 0.79 | 0.38 | 0.53 | 0.79 |
| Hungary | 0.29 | 0.41 | 0.60 | 0.29 | 0.41 | 0.60 | 0.29 | 0.41 | 0.60 |
| Slovakia | 0.34 | 0.36 | 0.38 | 0.34 | 0.36 | 0.38 | 0.34 | 0.36 | 0.38 |
| Germany | 0.29 | 0.29 | 0.30 | 0.29 | 0.29 | 0.30 | 0.29 | 0.29 | 0.30 |
| Czech Republic | 0.14 | 0.22 | 0.32 | 0.14 | 0.22 | 0.32 | 0.14 | 0.22 | 0.32 |
| Poland | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 |
| Bulgaria | 0.16 | 0.25 | 0.31 | 0.10 | 0.15 | 0.18 | 0.21 | 0.33 | 0.40 |

In the “GOV recommended rates (av. BGN 0.2)” scenario, rates in the Hungarian and Slovakian toll domains would be higher and rates in Poland and the Czech Republic would be lower.

In the “60% of GOV recommended rates (av. BGN 0.12)” scenario, only Poland would have slightly cheaper rates.

In the “130% of GOV recommended rates (av. BGN 0.24)” scenario, Austria and Hungary still would have significantly higher rates.

Figure 40. International Comparison of e-vignette Rates

| | e vignette rate option 1 | | | e vignette rate option 2 | | |
|-----------------|--------------------------|-----------|------------|--------------------------|-----------|-----------|
| | Weekly | Monthly | Annual | Weekly | Monthly | Annual |
| Hungary | | 32 | 286 | | 32 | 286 |
| Slovenia | 30 | 60 | 230 | 30 | 60 | 230 |
| Austria | | | 165 | | | 165 |
| Slovakia | 20 | 28 | 100 | 20 | 28 | 100 |
| Romania | 6 | 14 | 56 | 6 | 14 | 56 |
| Bulgaria | 10 | 25 | 150 | 10 | 25 | 97 |

In the “e-vignette rate option 1” scenario, Romania would have lower vignette rates overall and Slovakia would have lower annual rates. Every other toll domain including Slovenia and Hungary has higher vignette rates.

In the “e-vignette rate option 2” scenario, only Romania would have lower rates.

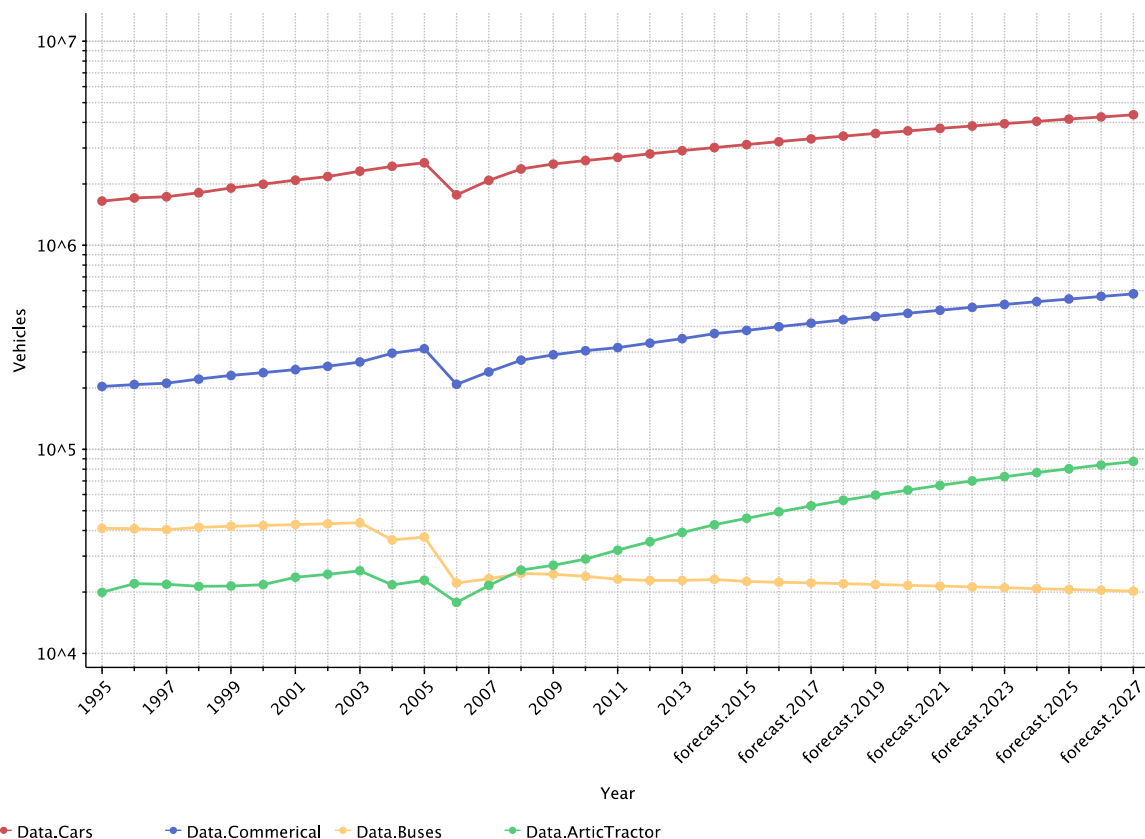
E Vehicles Module

A time series for domestic registered vehicles for the years 1995 to 2014 is available and used to extrapolate future vehicle numbers (cars, commercial, buses and articulated tractors) from 2015 to 2027.

All data received through official Bulgarian sources was cross-checked with data available through Eurostat⁷.

Error! Reference source not found. shows the historic and forecasted vehicle numbers divided into passenger cars, commercial vehicles, buses and articulated vehicles. Interestingly, in 2006 vehicle numbers were corrected to lower figures. The forecast is done linearly based on the historic data available. Note that the y-axis is logarithmic.

Figure 41. Vehicles Numbers (Historic and Forecast)



F Vignette Module

Current vignette usage data (domestic and border sales) is available as time series ranging from 2010 to 2014. The data is used to model e-vignette numbers for light vehicles (i.e. passenger cars) for the years 2015 to 2027.

The current vignette sales distinguished by vehicles category, vignette type and emission classes are shown in **Error! Reference source not found.**⁴²:

⁷ <http://ec.europa.eu/eurostat/web/transport/data/database>

- Category 1: Trucks ≥ 12 tons
- Category 2: Trucks < 12 tons
- Category 3: light vehicles i.e. passenger cars

Figure 42. Vignette Unit Sales

| | Time Series | | | | |
|---|-------------|-----------|-----------|-----------|-----------|
| | 2010 | 2011 | 2012 | 2013 | 2014 |
| Heavy Vehicles | | | | | |
| Category 1 | | | | | |
| Euro 0 - II | | | | | |
| weekly | 3 852 | 2 333 | 1 865 | 3 861 | 3 246 |
| monthly | 3 206 | 2 647 | 2 249 | 21 733 | 23 384 |
| annual | 8 239 | 7 530 | 6 432 | 5 599 | 4 748 |
| Sum of Category 1, Euro 0 - II Σ | 15 297 | 12 510 | 10 546 | 31 193 | 31 378 |
| Euro III - V+ | | | | | |
| weekly | 14 486 | 12 484 | 9 160 | 47 240 | 76 252 |
| monthly | 6 309 | 7 101 | 6 851 | 55 748 | 87 163 |
| annual | 8 287 | 9 097 | 9 861 | 10 570 | 10 578 |
| Sum of Category 1, Euro III - V+ Σ | 29 082 | 28 682 | 25 872 | 113 558 | 173 993 |
| EURO 0 - II Emission Ratio | 0.34 | 0.30 | 0.29 | 0.22 | 0.15 |
| Category 2 | | | | | |
| Euro 0 - II | | | | | |
| weekly | 6 674 | 5 041 | 4 283 | 9 073 | 8 579 |
| monthly | 5 214 | 5 101 | 4 937 | 19 459 | 23 242 |
| annual | 14 064 | 12 351 | 10 319 | 8 935 | 7 788 |
| Sum of Category 2, Euro 0 - III Σ | 25 952 | 22 493 | 19 539 | 37 467 | 39 609 |
| Euro III - V+ | | | | | |
| weekly | 12 164 | 13 111 | 11 789 | 19 498 | 22 009 |
| monthly | 5 227 | 6 290 | 6 859 | 21 107 | 29 916 |
| annual | 9 051 | 9 311 | 9 338 | 9 088 | 8 823 |
| Sum of Category 2, Euro III - V+ Σ | 26 442 | 28 712 | 27 986 | 49 693 | 60 748 |
| EURO 0 - II Emission Ratio | 0.50 | 0.44 | 0.41 | 0.43 | 0.39 |
| Category 1 & 2, daily | 1 961 732 | 2 337 506 | 2 461 953 | 1 564 762 | 1 324 532 |
| Sum of Heavy Vehicles Σ | 2 058 506 | 2 429 904 | 2 545 897 | 1 796 674 | 1 630 261 |
| Light Vehicles | | | | | |
| Category 3 | | | | | |
| weekly | 2 392 653 | 2 604 481 | 2 682 532 | 2 782 417 | 2 747 807 |
| monthly | 205 919 | 214 230 | 228 812 | 251 271 | 248 973 |
| annual | 1 520 167 | 1 601 964 | 1 601 609 | 1 700 281 | 1 757 995 |
| Sum of Category 3 Σ | 4 118 739 | 4 420 675 | 4 512 953 | 4 733 969 | 4 754 775 |

The current pricing of the vignettes and the revenues are shown in **Error! Reference source not found.**⁴³ and **Error! Reference source not found.**⁴⁴, respectively.

Figure 43. Vignette Prices in BGN

| | Time Series | | | | |
|-----------------------|-------------|-------|-------|-------|-------|
| | 2010 | 2011 | 2012 | 2013 | 2014 |
| Heavy Vehicles | | | | | |
| Category 1 | | | | | |
| Euro 0 – II | | | | | |
| weekly | 75 | 75 | 75 | 65 | 65 |
| monthly | 215 | 215 | 215 | 130 | 130 |
| annual | 1 300 | 1 300 | 1 300 | 1 300 | 1 300 |
| Euro III – V+ | | | | | |
| weekly | 58 | 58 | 58 | 50 | 50 |
| monthly | 165 | 165 | 165 | 100 | 100 |
| annual | 1 000 | 1 000 | 1 000 | 1 000 | 1 000 |
| Category 2 | | | | | |
| Euro 0 – II | | | | | |
| weekly | 43 | 43 | 43 | 34 | 34 |
| monthly | 117 | 117 | 117 | 68 | 68 |
| annual | 681 | 681 | 681 | 684 | 684 |
| Euro III – V+ | | | | | |
| weekly | 33 | 33 | 33 | 26 | 26 |
| monthly | 90 | 90 | 90 | 53 | 53 |
| annual | 524 | 524 | 524 | 526 | 526 |
| Category 1 & 2, daily | 13 | 13 | 13 | 20 | 20 |

Figure 44. Vignette Revenue in BGN

| | Time Series | | | | |
|--------------------------------------|-------------|-------------|-------------|-------------|-------------|
| | 2010 | 2011 | 2012 | 2013 | 2014 |
| Heavy Vehicles | | | | | |
| Category 1 | | | | | |
| Euro 0 - II | | | | | |
| weekly | 288 900 | 174 975 | 139 875 | 250 965 | 210 990 |
| monthly | 689 290 | 569 105 | 483 535 | 2 825 290 | 3 039 920 |
| annual | 10 710 700 | 9 789 000 | 8 361 600 | 7 278 700 | 6 172 400 |
| Sum of Category 1, Euro 0 Σ | 11 688 890 | 10 533 080 | 8 985 010 | 10 354 955 | 9 423 310 |
| Euro III - V+ | | | | | |
| weekly | 840 188 | 724 072 | 531 280 | 2 362 000 | 3 812 600 |
| monthly | 1 040 985 | 1 171 665 | 1 130 415 | 5 574 800 | 8 716 300 |
| annual | 8 287 000 | 9 097 000 | 9 861 000 | 10 570 000 | 10 578 000 |
| Sum of Category 1, Euro III Σ | 10 168 173 | 10 992 737 | 11 522 695 | 18 506 800 | 23 106 900 |
| Category 2 | | | | | |
| Euro 0 - II | | | | | |
| weekly | 286 982 | 216 763 | 184 169 | 308 482 | 291 686 |
| monthly | 610 038 | 596 817 | 577 629 | 1 323 212 | 1 580 456 |
| annual | 9 577 584 | 8 411 031 | 7 027 239 | 6 111 540 | 5 326 992 |
| Sum of Category 2, Euro 0 Σ | 10 474 604 | 9 224 611 | 7 789 037 | 7 743 234 | 7 199 134 |
| Euro III - V+ | | | | | |
| weekly | 401 412 | 432 663 | 389 037 | 506 948 | 572 234 |
| monthly | 470 430 | 566 100 | 617 310 | 1 118 671 | 1 585 548 |
| annual | 4 742 724 | 4 878 964 | 4 893 112 | 4 780 288 | 4 640 898 |
| Sum of Category 2, Euro III Σ | 5 614 566 | 5 877 727 | 5 899 459 | 6 405 907 | 6 798 680 |
| Category 1 & 2, daily | 25 502 516 | 30 387 578 | 32 005 389 | 31 295 240 | 26 490 640 |
| Sum of Heavy Vehicles Σ | 63 448 749 | 67 015 733 | 66 201 590 | 74 306 136 | 73 018 664 |
| Light Vehicles | | | | | |
| Category 3 | | | | | |
| weekly | 23 926 530 | 26 044 810 | 26 825 320 | 27 824 170 | 27 478 070 |
| monthly | 5 147 975 | 5 355 750 | 5 720 300 | 6 281 775 | 6 224 325 |
| annual | 101 851 189 | 107 331 588 | 107 307 803 | 113 918 827 | 117 785 665 |
| Sum of Category 3 Σ | 130 925 694 | 138 732 148 | 139 853 423 | 148 024 772 | 151 488 060 |

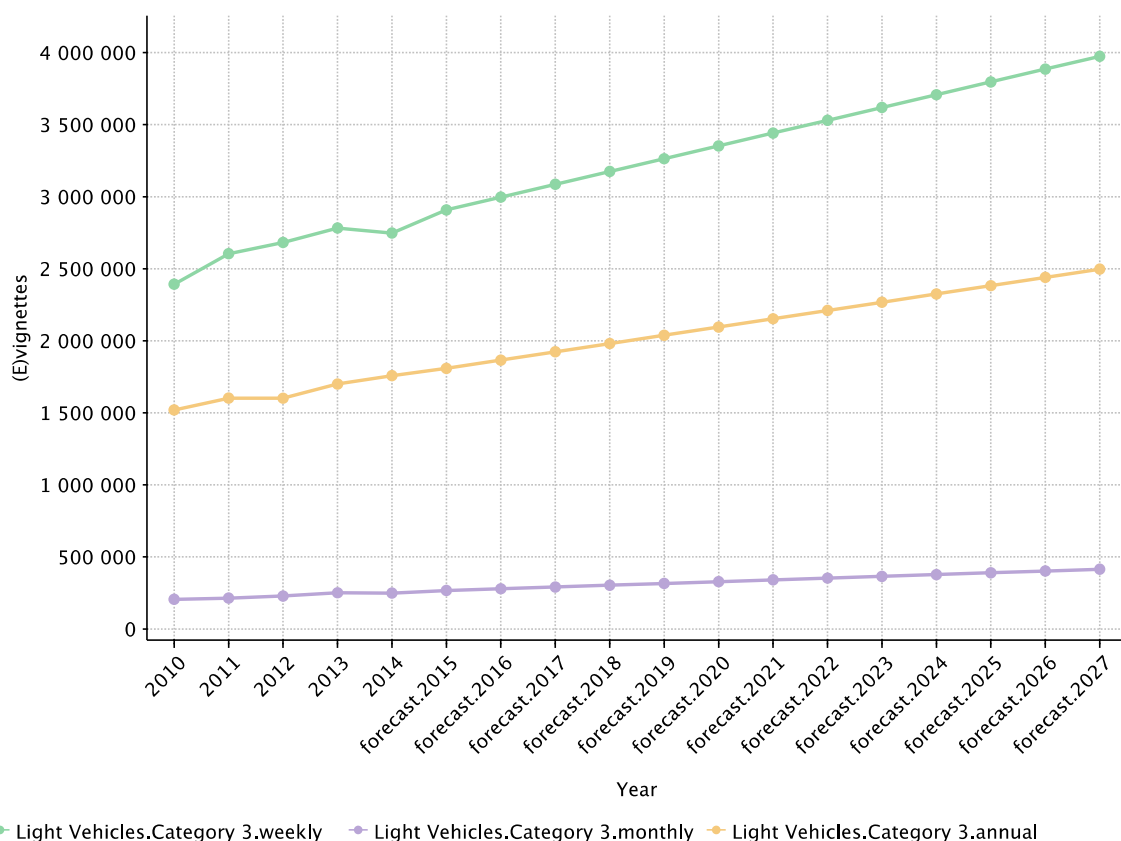
The vignette sales at borders - shown partly in **Error! Reference source not found.**– are used to estimate foreign vehicle activity and model GNSS box (i.e. “On-Board Unit (OBU)”) numbers for e-tolling.

Figure 45. Vignette Border Sales in 2013 (Some Border Crossings Only)

| | Bregovo | Varna-ferry | Vidin – Ferry | Vrashka Chuka | Gueshevo | Danube Bridge II | Durankulak | Zlatarevo | Zlatograd | Ilinden | Kaloti |
|--|---------|-------------|---------------|---------------|----------|------------------|------------|-----------|-----------|---------|--------|
| Category 1 & Category 2 Daily vignette | 1010 | 1580 | 6472 | 1144 | 12595 | | 2880 | 12068 | 28 | 1520 | 67 |
| Annual Vignette | | | | | | | | | | | |
| Category 1 Annual vignette - EUR 0, I, II | 1 | | | | | | 7 | 6 | | | |
| Category 1 Annual vignette - EUR III, IV, V, EEV and higher | | | 2 | | 8 | | 4 | 16 | | 4 | |
| Category 2 Annual vignette - EUR 0, I, II | | | | | 1 | | | 1 | 1 | 4 | |
| Category 2 Annual vignette - EUR III, IV, V, EEV and higher | 4 | 1 | 2 | 3 | 1 | | 1 | 1 | 5 | | |
| Sum of Annual Vignette | 5 | 1 | 4 | 3 | 10 | 0 | 12 | 24 | 6 | 8 | |
| Monthly Vignette | | | | | | | | | | | |
| Category 1 Monthly vignette - EUR 0, I, II | 1 | | 4 | 7 | 39 | | | 33 | | 13 | |
| Category 1 Monthly vignette - EUR III, IV, V, EEV and higher | 62 | | 279 | 95 | 334 | | 23 | 152 | | 28 | |
| Category 2 Monthly vignette - EUR 0, I, II | 4 | | 4 | 2 | 1 | | 255 | 4 | | 4 | |
| Category 2 Monthly vignette - EUR III, IV, V, EEV and higher | 1 | | 3 | 3 | 3 | | 168 | 4 | 2 | 13 | |
| Sum of Monthly Vignette | 68 | 0 | 290 | 107 | 377 | 0 | 446 | 193 | 2 | 58 | |
| Weekly Vignette | | | | | | | | | | | |
| Category 1 Weekly vignette - EUR 0, I, II | 1 | 2 | 2 | | 75 | | 11 | 27 | | 4 | |
| Category 1 Weekly vignette - EUR III, IV, V, EEV and higher | 60 | | 784 | 119 | 984 | | 78 | 426 | | 13 | |
| Category 2 Weekly vignette - EUR 0, I, II | 11 | 3 | 7 | 6 | 32 | | 230 | 24 | 1 | 6 | |
| Category 2 Weekly vignette - EUR III, IV, V, EEV and higher | 7 | | 94 | 36 | 168 | | 542 | 42 | 4 | 10 | |
| Sum of Weekly Vignette | 79 | 5 | 887 | 161 | 1259 | 0 | 861 | 519 | 5 | 33 | |
| Category 3 | | | | | | | | | | | |
| Category 3 Annual vignette | 217 | 78 | 200 | 293 | 565 | | 717 | 503 | 539 | 781 | |
| Category 3 Monthly vignette | 205 | 1 | 199 | 1581 | 308 | | 2927 | 298 | 179 | 138 | |
| Category 3 Weekly vignette | 4017 | 233 | 3598 | 8438 | 29272 | | 96086 | 14976 | 8713 | 11293 | 75 |
| Sum of Category 3 | 4439 | 312 | 3997 | 10312 | 30145 | 0 | 99730 | 15777 | 9431 | 12212 | 77 |

Error! Reference source not found.46 shows the time series data for current light vehicles vignette sales and the linearly forecasted e-vignettes sales as used in modelling the e-vignette revenue.

Figure 46. Current and Forecasted e-vignette Units



Despite the pricing changes in “e-vignette rate option 1” and “e-vignette rate option 2”, vignette ratios between weekly, monthly and annual e-vignette numbers have been kept the same as current vignettes for two reasons:

- There is no user behaviour data with the introduction of e-vignettes⁸ or any time series where the pricing between the vignette types changed, but
- pricing changes introduced for heavy vehicles in 2013 - see figures 51 and 52 - resulted in different distributions of weekly, monthly and annual vignettes but the overall gross revenue figure including the trend has not changed much.

Therefore, in absence of user behaviour data (1) but given the fact of (2) we assume the the resulting gross revenue for e-vignettes over time can plausibly be estimated multiplying linearly forecasted e-vignette numbers with prices despite the pricing changes and changes in the e-vignette type ratios.

G System Cost and Operational Assumptions Module

This module includes a table with cost of existing e-tolling and e-vignette systems. All data in the table is validated through published reports and official sources such as but not limited to:

- Hegner R. et. al., St. Galler Mautstudie, 2013
- Demerlé R., Thinking Highways, Vol. 6. No. 4, 2012
- Bundesamt für Güterverkehr (BAG), Mautstatistik 2013
- Karel Cerny, Electronic toll collection in the Czech Republic., 2009

In addition, the team has worked on many schemes worldwide and have peer reviewed the costs assumptions based on their experiences.

The data is used to calculate Capital (Capex) and Operational (Opex) expenditures for current best-practice e-tolling and e-vignette systems. Relevant e-tolling national free-flow systems in Germany, Hungary, Slovakia, Poland, Switzerland and France⁹ were evaluated.

Relative figures for Capex and Opex were derived as functions of network size, vehicle population and annual kilometres tolled as shown in the equations (1) and (2).

$$(1) \text{ capex}_{relative} \xrightarrow{\text{calculated}} f(\text{network size, vehicle population})$$

$$(2) \text{ opex}_{relative} \xrightarrow{\text{calculated}} f(\text{annual kilometres tolled, vehicle population})$$

Capex_{relative} , Opex_{relative} and transaction cost for e-vignettes and routes passes and each network scenario is shown in **Error! Reference source not found.**⁴⁷.

⁸ A user behaviour survey was beyond the scope of this project.

⁹ Although the France Ecotaxe system was not made operational it was nevertheless fully built and tested. Capex and (planned) Opex figures are available.

Figure 47. Capex_{relative}, Opex_{relative} and Transaction Cost for e-vignettes and Routes Passes and Each Network Scenario

| Cost [EUR] | (a) m+1st | (b) m+1st+2nd | (c) m+1st+2nd+3rd |
|--|-----------|---------------|-------------------|
| ¹ Average Capex existing and comparable systems per tolled network km without OBU | 59 410 | 35 646 | 17 823 |
| ² Average Opex existing and comparable systems per annual tolled km | 0.0230 | 0.0207 | 0.0184 |
| ³ Transaction Cost per e-vignette | 1 | 1 | 1 |
| ⁴ Transaction Cost per transit route pass | 2 | 2 | 2 |

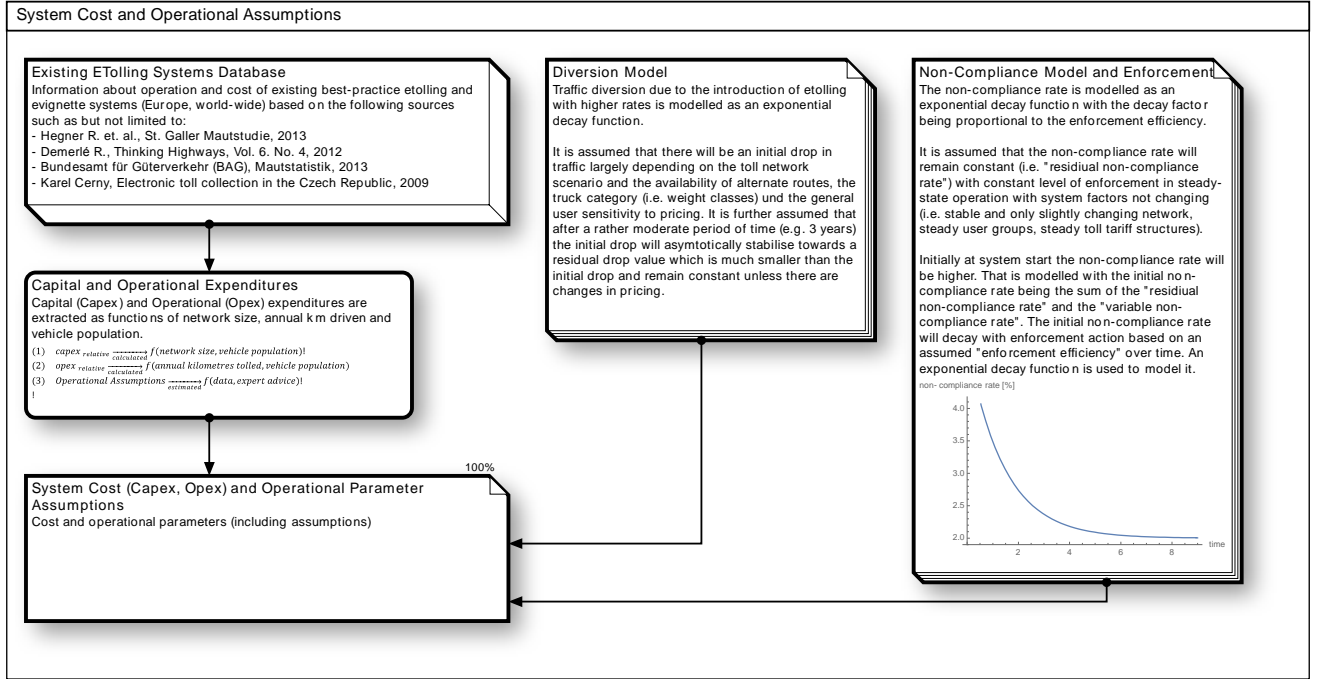
(3) *Operational Assumptions* $\xrightarrow[\text{estimated}]{} f(\text{data, expert advice})$

The most important operations assumptions are:

- **Prices for GNSS boxes** i.e. “On-board Units (OBU)” and average lifespan: given the trend of current e-tolling OBU prices and the availability of “off-the-shelf” components including smartphone based approaches recently announced, we assume an average OBU price of EUR 100 for the operation of the e-tolling scheme and an average lifespan (or MTBF) per OBU of 5 years.
- **Foreign Users and OBU use.** We anticipate a relatively high ratio of route passes (because of the current high numbers of daily vignettes used for foreign vehicles). In case foreign users acquire an OBU we assume that 30% of these will return the next year.
- **Fleet Management.** We anticipate the use of data from fleet management units (i.e. GNSS points as a “snail trail”) substituting normal OBUs for data acquisition. We assume
 - 70% of articulated trucks and
 - 20% of commercial vehicles
 will use fleet management data instead of OBUs.
- **E-vignette.** Based on the data we assume that about 30% of current possible vignette gross revenue is lost due to non-compliance (from potential weekly and monthly vignette revenue) and 70% of that lost revenue can be regained through e-vignettes in combination with rigorous enforcement (using synergies with e-tolling enforcement).
- **Non-Compliance and Enforcement.** We assume that initial non-compliance in an e-tolling scenario will be about 5%, declining in a steady state operation to 2% through the combination of stationary and mobile enforcement.

Figure 48 shows the relationships and data flows in the module to derive relative capex and opex figures.

Figure 48. System Cost and Operational Assumptions Module



H Revenue and Cost Processing Module

In this module, all data and pre-processed figures from other modules are aggregated to estimate revenue and cost for three different pricing and three different network scenarios.

The following equations are used for revenues:

$$(4) \text{ Revenues}_{etolling, route-passes} \rightarrow f(\text{network scenarios}, etolling\ pricing\ scenarios)$$

$$(5) \text{ Revenues}_{evignette} \rightarrow f(\text{vehicle population}, evignette\ pricing\ scenarios)$$

Revenues for e-tolling are estimated per section as a function of the three network scenarios and three pricing scenarios. Revenues for e-vignette are estimated based on vehicle population and vignette pricing.

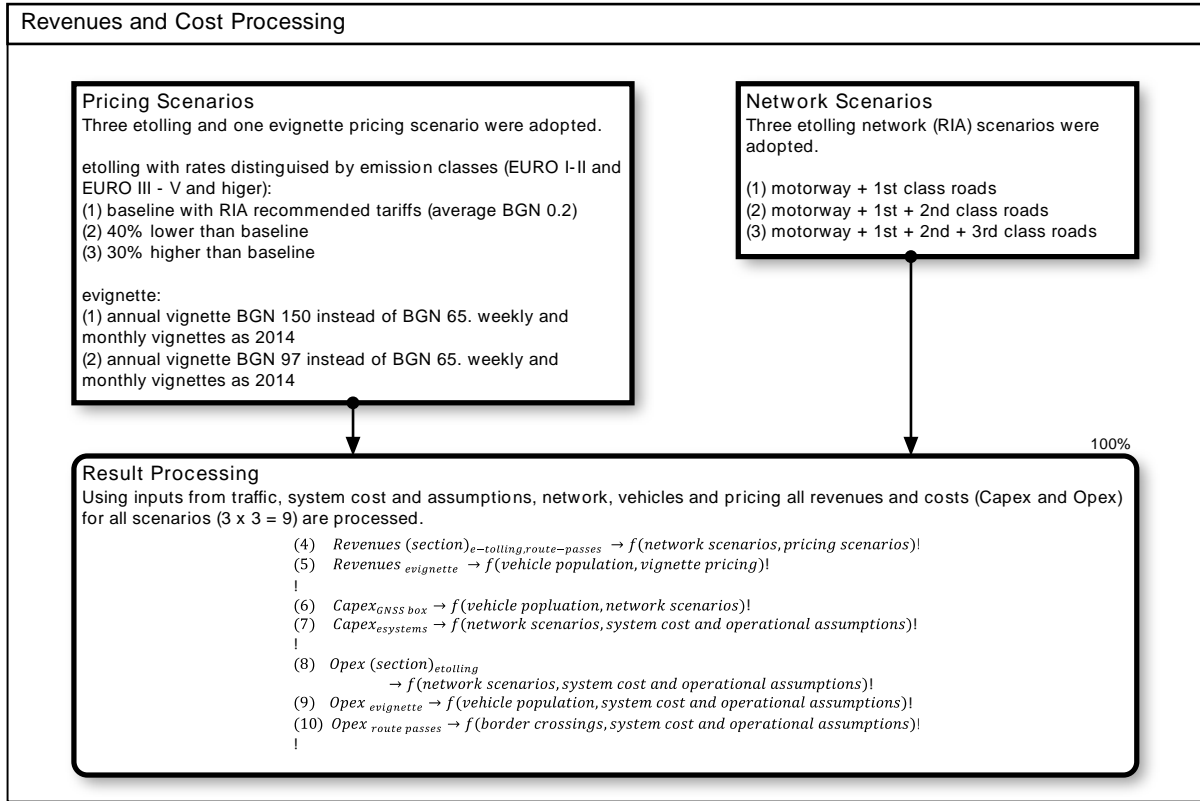
$$(6) Capex_{GNSS\ box} \rightarrow f(\text{vehicle population}, network\ scenarios)$$

$$(7) Capex_{esystems} \rightarrow f(\text{network scenarios}, system\ cost\ and\ operational\ assumptions)$$

The cost for OBUs largely depends on the vehicle population influenced by the three network scenarios. Hence, the costs are a function of those values which have been estimated in other modules for the years 2015 to 2027. The capital expenditures (Capex) for design and building the systems (i.e. e-vignette and e-tolling) are largely dependent on network size, system costs (i.e. $capex_{relative}$ and $opex_{relative}$) and operational assumptions.

Error! Reference source not found.49 shows the network scenarios and pricing scenarios (e-tolling and e-vignette) as they influence the result processing in the cost and revenue module.

Figure 49. Revenue and Cost Processing



$$(8) Opex_{(section)_{etolling}} \rightarrow f(network\ scenarios, system\ cost\ and\ operational\ assumptions)$$

$$(9) Opex_{evignette} \rightarrow f(vehicle\ population, system\ cost\ and\ operational\ assumptions)$$

$$(10) Opex_{route\ passes} \rightarrow f(border\ crossings, system\ cost\ and\ operational\ assumptions)$$

Operational expenditures (Opex) for e-tolling depend on the three network scenarios. These impact annual kilometres driven (and tolled) on the RIA road network. The annual kilometres driven are estimated for the years 2016 to 2027 based on AADT data from the traffic module.

Operational expenditures (Opex) for e-vignettes depend on the vehicles population as established in the vehicle module and vignette module as time series, in combination with parameters from the system cost and assumptions module.

Operational expenditures (Opex) for route passes are based on the extrapolated current border crossing data (i.e. vignette sales at borders) in combination with parameters from the system cost and assumptions module.

19 Results

A Overview

Each of the three network scenarios agreed in deliverable 1 is presented, as well as three e-tolling pricing scenarios and two e-vignette scenarios as a check of sensitivity to rate changes.

In each scenario, e-tolling and e-vignette operation starts from the first year of operation in 2018. Operational costs of e-tolling and e-vignette including revenue flow start in 2018 and last until 2027. The year 2017 is anticipated as the build year within which most of the capital expenditures (Capex) will occur.

For each scenario the results are presented as:

- Net Present Values (NPV) of net revenues is given discounted to the year 2017 using a rate of 7% which conservatively covers the cost of finance, and
- Undiscounted gross revenue, cost and net revenue for the implementation year (i.e. Capex to design and build the system), cost (i.e. Opex) and the resulting net revenue available from the e-tolling and e-vignette schemes.

The NPV method of showing financial results is taking into account risk by discounting future net revenue. Using a rather high discount rate of 7% the NPV of the net revenues give a very conservative view of achievable Government income through the introduction of electronic tolling.

Undiscounted gross revenue, cost and net revenue is shown as an alternative, “raw” representation of the results. It is a rather optimistic view on achievable Government income introducing electronic tolling.

A complete business plan including a cash flow analysis is beyond the scope of this strategic report.

All result figures are given in Bulgarian Lev (BGN).

B Net Present Values (NPV)

Figure 50 shows the net present values (NPV) for each of the total 18 scenarios.

Figure 50. Net Present Values of the 18 Scenarios Evaluated

| | GOV recommended rates (av. BGN 0.2) | 60% of GOV recommended rates (av. BGN 0.12) | 130% of GOV recommended rates (av. BGN 0.26) |
|---|-------------------------------------|---|--|
| (a) m+1st | | | |
| npv net revenue (discounted with 7% to base year 2017) [Mio.] | | | |
| evignette rate option 1 | 5 123 | 3 434 | 6 390 |
| evignette rate option 2 | 4 354 | 2 664 | 5 621 |
| (b) m+1st+2nd | | | |
| npv net revenue (discounted with 7% to base year 2017) [Mio.] | | | |
| evignette rate option 1 | 6 632 | 4 129 | 8 509 |
| evignette rate option 2 | 5 862 | 3 360 | 7 739 |
| (c) m+1st+2nd+3rd | | | |
| npv net revenue (discounted with 7% to base year 2017) [Mio.] | | | |
| evignette rate option 1 | 7 764 | 4 658 | 10 093 |
| evignette rate option 2 | 6 995 | 3 889 | 9 324 |

The baseline NPV values range from about 3.4 Billion BGN to 10.1 Billion BGN over ten years of operation depending on a combination of network size and rating scenarios for e-tolling and e-vignettes.

In the NPV calculation with “Government recommended rates (av. BGN 0.2)”, regardless of the e-vignette rate options and the network size, the average yearly net revenue would always be well above the target 400 Mio. BGN ranging from 435 Mio. BGN to 776 Mio. BGN.

In a “60% of GOV recommended rates (av. BGN 0.12)” scenario, the NPV based average yearly net revenue would range from about 270 Mio. BGN to 466 Mio BGN depending on the e-vignette rate options and the network size. Hence they would not all meet the target. Allied to the above this suggests some flexibility on rates is possible if later required.

In a “130% of GOV recommended rates (av. BGN 0.24)” scenario, the NPV based average yearly net revenue would range from about 560 Mio. BGN to 1 Billion BGN depending on the e-vignette rate options and the network size.

C Gross Revenue, Cost (Capex and Opex) and Net Revenue

19.C.1 Results

Error! Reference source not found.⁵¹ and **Error! Reference source not found.**⁵² show tables providing a view on the gross revenue, cost and net revenue situation for each of the 18 scenario combinations evaluated.¹⁰

Error! Reference source not found.⁵¹ shows 9 options with e-vignette option 1.

Error! Reference source not found.⁵² shows 9 options with e-vignette option 2.

The tables show the initial investment for the design and building of the e-tolling and e-vignette systems in the year 2017. These values (Sum of Cost in 2017) can be considered the

¹⁰ More details e.g. figures for each year of operation are provided in the actual financial model available to the Government in fully electronic form.

initial capital expenditure (Capex) which depending on the adopted procurement model will be spent and financed by an operator. Depending on the procurement and operational model adopted by the Government the Capex may be paid back as a lump sum in the first year or it may be spread over the operational period (or part of it) and paid through operator remuneration.

Furthermore, the tables show the first and last year of operation with total revenues (divided into e-tolling and e-vignette revenue), operational cost (i.e. Opex, divided into e-tolling, e-vignette and route pass) and the net revenue available from electronic tolling.

The operational cost/revenue ratio is an indicator for the “efficiency” of scheme (revenue vs cost). Based on international experience it should be less than 0.20 but usually around 0.15.

19.C.2 E-vignette Option 1

Figure 51. Gross Revenue, Cost and Net Revenue (implementation, 1st and last operational year) for the Three Network and e-tolling Rate Scenarios and e-vignette Rate Option 1 in Mio. BGN

| | | GOV recommended rates (av. BGN 0.2) | | | 60% of GOV recommended rates (av. BGN 0.12) | | | 130% of GOV recommended rates (av. BGN 0.26) | | | |
|--|--|-------------------------------------|-----------|-----------|---|-----------|-----------|--|-----------|-----------|---------|
| | | 2017 | operation | | 2017 | operation | | 2017 | operation | | |
| | | | 2018 | 2027 | | 2018 | 2027 | | 2018 | 2027 | |
| (a) m+ 1st | | | | | | | | | | | |
| total revenue [Mio.] | | | | | | | | | | | |
| e- tolling (incl. route passes) | | | 526.719 | 729.258 | | 316.032 | 437.555 | | 684.735 | 948.035 | |
| e- vignette | | | 345.260 | 435.914 | | 345.260 | 435.914 | | 345.260 | 435.914 | |
| Sum of revenue | | Σ | 871.980 | 1 165.172 | | 661.292 | 873.468 | | 1 029.995 | 1 383.949 | |
| cost [Mio.] | | | | | | | | | | | |
| Operation (Opex) | | | | | | | | | | | |
| e- tolling | | | 125.808 | 176.332 | | 125.808 | 176.332 | | 125.808 | 176.332 | |
| e- vignette | | | 10.701 | 13.497 | | 10.701 | 13.497 | | 10.701 | 13.497 | |
| route pass | | | 2.922 | 4.534 | | 2.922 | 4.534 | | 2.922 | 4.534 | |
| Sum of cost | | Σ | 479.086 | 148.288 | 206.184 | 479.086 | 148.288 | 206.184 | 479.086 | 148.288 | 206.184 |
| net revenue [Mio.] | | - 479.086 | 723.691 | 958.988 | - 479.086 | 513.003 | 667.285 | - 479.086 | 881.707 | 1 177.765 | |
| operational cost/ revenue ratio | | | 0.170 | 0.177 | | 0.224 | 0.236 | | 0.144 | 0.149 | |
| npv net revenue (discounted with 7%to base year 2017) [Mio.] | | 5 123 | | | 3 434 | | | 6 390 | | | |
| (b) m+ 1st+ 2nd | | | | | | | | | | | |
| total revenue [Mio.] | | | | | | | | | | | |
| e- tolling (incl. route passes) | | | 820.977 | 1 071.216 | | 492.586 | 642.729 | | 1 067.270 | 1 392.580 | |
| e- vignette | | | 345.260 | 435.914 | | 345.260 | 435.914 | | 345.260 | 435.914 | |
| Sum of revenue | | Σ | 1 166.237 | 1 507.129 | | 837.847 | 1 078.643 | | 1 412.531 | 1 828.494 | |
| cost [Mio.] | | | | | | | | | | | |
| Operation (Opex) | | | | | | | | | | | |
| e- tolling | | | 185.900 | 243.653 | | 185.900 | 243.653 | | 185.900 | 243.653 | |
| e- vignette | | | 10.701 | 13.497 | | 10.701 | 13.497 | | 10.701 | 13.497 | |
| route pass | | | 2.922 | 4.534 | | 2.922 | 4.534 | | 2.922 | 4.534 | |
| Sum of cost | | Σ | 601.215 | 209.802 | 275.408 | 601.215 | 209.802 | 275.408 | 601.215 | 209.802 | 275.408 |
| net revenue [Mio.] | | - 601.215 | 956.435 | 1 231.721 | - 601.215 | 628.044 | 803.235 | - 601.215 | 1 202.728 | 1 553.086 | |
| operational cost/ revenue ratio | | | 0.180 | 0.183 | | 0.250 | 0.255 | | 0.149 | 0.151 | |
| npv net revenue (discounted with 7%to base year 2017) [Mio.] | | 6 632 | | | 4 129 | | | 8 509 | | | |
| (c) m+ 1st+ 2nd+ 3rd | | | | | | | | | | | |
| total revenue [Mio.] | | | | | | | | | | | |
| e- tolling (incl. route passes) | | | 1 068.884 | 1 315.599 | | 641.330 | 789.360 | | 1 389.549 | 1 710.279 | |
| e- vignette | | | 345.260 | 435.914 | | 345.260 | 435.914 | | 345.260 | 435.914 | |
| Sum of revenue | | Σ | 1 414.144 | 1 751.513 | | 986.591 | 1 225.273 | | 1 734.809 | 2 146.192 | |
| cost [Mio.] | | | | | | | | | | | |
| Operation (Opex) | | | | | | | | | | | |
| e- tolling | | | 228.900 | 281.494 | | 228.900 | 281.494 | | 228.900 | 281.494 | |
| e- vignette | | | 10.701 | 13.497 | | 10.701 | 13.497 | | 10.701 | 13.497 | |
| route pass | | | 2.922 | 4.534 | | 2.922 | 4.534 | | 2.922 | 4.534 | |
| Sum of cost | | Σ | 745.076 | 253.276 | 313.884 | 745.076 | 253.276 | 313.884 | 745.076 | 253.276 | 313.884 |
| net revenue [Mio.] | | - 745.076 | 1 160.868 | 1 437.628 | - 745.076 | 733.315 | 911.389 | - 745.076 | 1 481.533 | 1 832.308 | |
| operational cost/ revenue ratio | | | 0.179 | 0.179 | | 0.257 | 0.256 | | 0.146 | 0.146 | |
| npv net revenue (discounted with 7%to base year 2017) [Mio.] | | 7 764 | | | 4 658 | | | 10 093 | | | |

19.C.3 Discussion of Outcomes with Option 1

Except for combination of e-tolling scenario “60% of GOV recommended rates (av. BGN 0.12)” and road network scenario “m + 1st + 2nd + 3rd class roads” in all scenarios with e-vignette rate option 1 - figure 20 - the electronic tolling schemes would essentially break even in the first year of operation. In other words the Sum of Cost in 2017 = Initial Capex is less than net revenue in 2018.

In the “GOV recommended rates (av. BGN 0.2)” scenario net revenue in the “road network scenario m + 1st + 2nd + 3rd class roads” would reach almost 1.5 Billion BGN in the last year of operation (2027).

The net revenue available in the first year of operation (2018) ranges from 513 Mio. BGN in the “60% of GOV recommended rates (av. BGN 0.12)” and “m + 1st class roads” scenario combination to 1.5 Billion BGN in the “130% of GOV recommended rates (av. BGN 0.26)” and “m + 1st + 2nd + 3rd class roads” scenario combination. All exceed the 400Mio .BGN target.

19.C.4 E-vignette Option 2

Figure 52. Gross Revenue, Cost, and Net Revenue (implementation, 1st and last operational year) for the Three Network and e-tolling Rate Scenarios and e-vignette Rate Option 2 in Mio. BGN

| | | GOV recommended rates (av. BGN 0.2) | | | 60% of GOV recommended rates (av. BGN 0.12) | | | 130% of GOV recommended rates (av. BGN 0.26) | | | |
|--|--|-------------------------------------|-----------|-----------|---|-----------|-----------|--|-----------|-----------|---------|
| | | 2017 | operation | | 2017 | operation | | 2017 | operation | | |
| | | | 2018 | 2027 | | 2018 | 2027 | | 2018 | 2027 | |
| (a) m+ 1st | | | | | | | | | | | |
| total revenue [Mio.] | | | | | | | | | | | |
| e- tolling (incl. route passes) | | | 526.719 | 729.258 | | 316.032 | 437.555 | | 684.735 | 948.035 | |
| e- vignette | | | 240.115 | 303.347 | | 240.115 | 303.347 | | 240.115 | 303.347 | |
| Sum of revenue | | Σ | 766.834 | 1 032.605 | | 556.146 | 740.902 | | 924.850 | 1 251.382 | |
| cost [Mio.] | | | | | | | | | | | |
| Operation (Opex) | | | | | | | | | | | |
| e- tolling | | | 125.808 | 176.332 | | 125.808 | 176.332 | | 125.808 | 176.332 | |
| e- vignette | | | 10.701 | 13.497 | | 10.701 | 13.497 | | 10.701 | 13.497 | |
| route pass | | | 2.922 | 4.534 | | 2.922 | 4.534 | | 2.922 | 4.534 | |
| Sum of cost | | Σ | 479.086 | 148.288 | 206.184 | 479.086 | 148.288 | 206.184 | 479.086 | 148.288 | 206.184 |
| net revenue [Mio.] | | - 479.086 | 618.546 | 826.421 | - 479.086 | 407.858 | 534.718 | - 479.086 | 776.561 | 1 045.199 | |
| operational cost/ revenue ratio | | | 0.193 | 0.200 | | 0.267 | 0.278 | | 0.160 | 0.165 | |
| npv net revenue (discounted with 7%to base year 2017) [Mio.] | | 4 354 | | | 2 664 | | | 5 621 | | | |
| (b) m+ 1st+2nd | | | | | | | | | | | |
| total revenue [Mio.] | | | | | | | | | | | |
| e- tolling (incl. route passes) | | | 820.977 | 1 071.216 | | 492.586 | 642.729 | | 1 067.270 | 1 392.580 | |
| e- vignette | | | 240.115 | 303.347 | | 240.115 | 303.347 | | 240.115 | 303.347 | |
| Sum of revenue | | Σ | 1 061.092 | 1 374.562 | | 732.701 | 946.076 | | 1 307.385 | 1 695.927 | |
| cost [Mio.] | | | | | | | | | | | |
| Operation (Opex) | | | | | | | | | | | |
| e- tolling | | | 185.900 | 243.653 | | 185.900 | 243.653 | | 185.900 | 243.653 | |
| e- vignette | | | 10.701 | 13.497 | | 10.701 | 13.497 | | 10.701 | 13.497 | |
| route pass | | | 2.922 | 4.534 | | 2.922 | 4.534 | | 2.922 | 4.534 | |
| Sum of cost | | Σ | 601.215 | 209.802 | 275.408 | 601.215 | 209.802 | 275.408 | 601.215 | 209.802 | 275.408 |
| net revenue [Mio.] | | - 601.215 | 851.290 | 1 099.154 | - 601.215 | 522.899 | 670.668 | - 601.215 | 1 097.583 | 1 420.519 | |
| operational cost/ revenue ratio | | | 0.198 | 0.200 | | 0.286 | 0.291 | | 0.160 | 0.162 | |
| npv net revenue (discounted with 7%to base year 2017) [Mio.] | | 5 862 | | | 3 360 | | | 7 739 | | | |
| (c) m+ 1st+ 2nd+ 3rd | | | | | | | | | | | |
| total revenue [Mio.] | | | | | | | | | | | |
| e- tolling (incl. route passes) | | | 1 068.884 | 1 315.599 | | 641.330 | 789.360 | | 1 389.549 | 1 710.279 | |
| e- vignette | | | 240.115 | 303.347 | | 240.115 | 303.347 | | 240.115 | 303.347 | |
| Sum of revenue | | Σ | 1 308.999 | 1 618.946 | | 881.445 | 1 092.706 | | 1 629.664 | 2 013.626 | |
| cost [Mio.] | | | | | | | | | | | |
| Operation (Opex) | | | | | | | | | | | |
| e- tolling | | | 228.900 | 281.494 | | 228.900 | 281.494 | | 228.900 | 281.494 | |
| e- vignette | | | 10.701 | 13.497 | | 10.701 | 13.497 | | 10.701 | 13.497 | |
| route pass | | | 2.922 | 4.534 | | 2.922 | 4.534 | | 2.922 | 4.534 | |
| Sum of cost | | Σ | 745.076 | 253.276 | 313.884 | 745.076 | 253.276 | 313.884 | 745.076 | 253.276 | 313.884 |
| net revenue [Mio.] | | - 745.076 | 1 055.723 | 1 305.062 | - 745.076 | 628.169 | 778.822 | - 745.076 | 1 376.388 | 1 699.741 | |
| operational cost/ revenue ratio | | | 0.193 | 0.194 | | 0.287 | 0.287 | | 0.155 | 0.156 | |
| npv net revenue (discounted with 7%to base year 2017) [Mio.] | | 6 995 | | | 3 889 | | | 9 324 | | | |

19.C.5 Discussion of Outcomes with e-vignette 2

In an “e-vignette option 2” scenario combination –net revenues overall are about 105 Mio. BGN lower compared to “e-vignette option 1” scenarios. That is because of the lower annual rate modelled for light vehicles’ e-vignettes.

Nevertheless, the “GOV recommended rates (av. BGN 0.2)” scenarios still show good net revenue for the first year of operation. In that scenario, the investment into the electronic tolling schemes could still break-even in the first year of operation (Sum of Cost in 2017 = Initial Capex is less than net revenue in 2018) and there would still be a small “profit” left from electronic tolling.

In the scenario combination “GOV recommended rates (av. BGN 0.2)” and “road network scenario m + 1st + 2nd class roads” or “road network scenario m + 1st + 2nd + 3rd class roads” this small “profit” after break-even would be actually larger than the current total revenue from the existing vignette scheme in 2014.

D Results Geo-referenced to Bulgarian Roads and NUTS2 Regions

Error! Reference source not found.⁵³ and **Error! Reference source not found.**⁵⁴ show example results - net present values (NPV) of total revenues - geo-referenced on the RIA road network and cumulated for the Bulgarian NUTS2 regions.

This is to show the potential of using the results in combination with a GIS for visualisation and decision support.

Figure 53. NPV by Road Section Using Baseline Tariffs in Euro

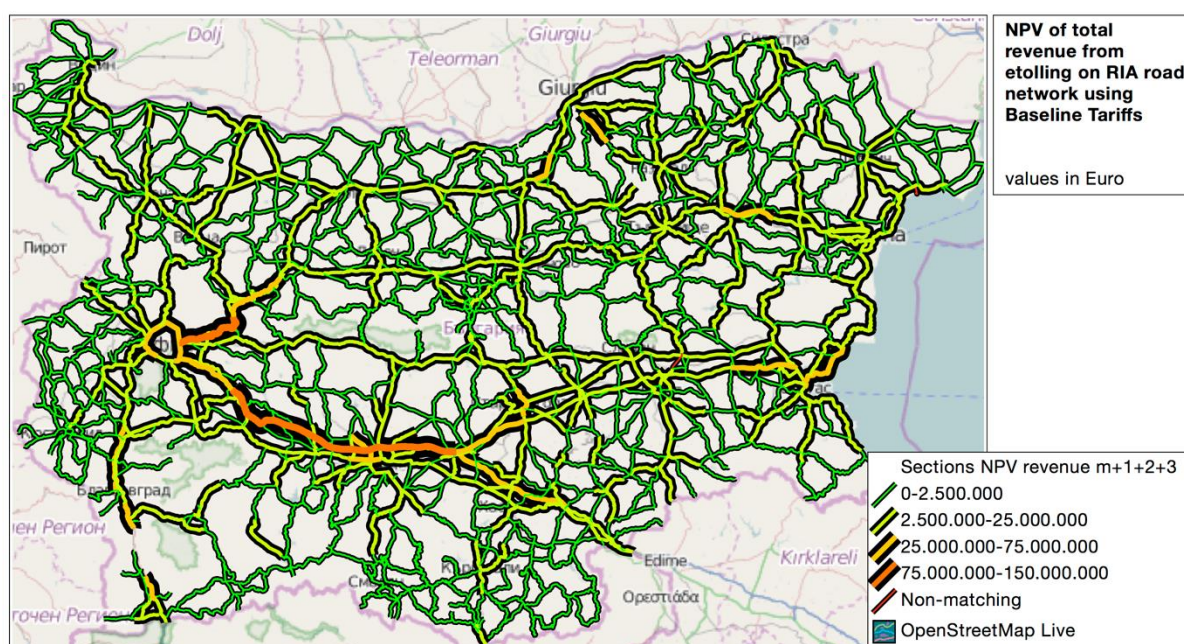
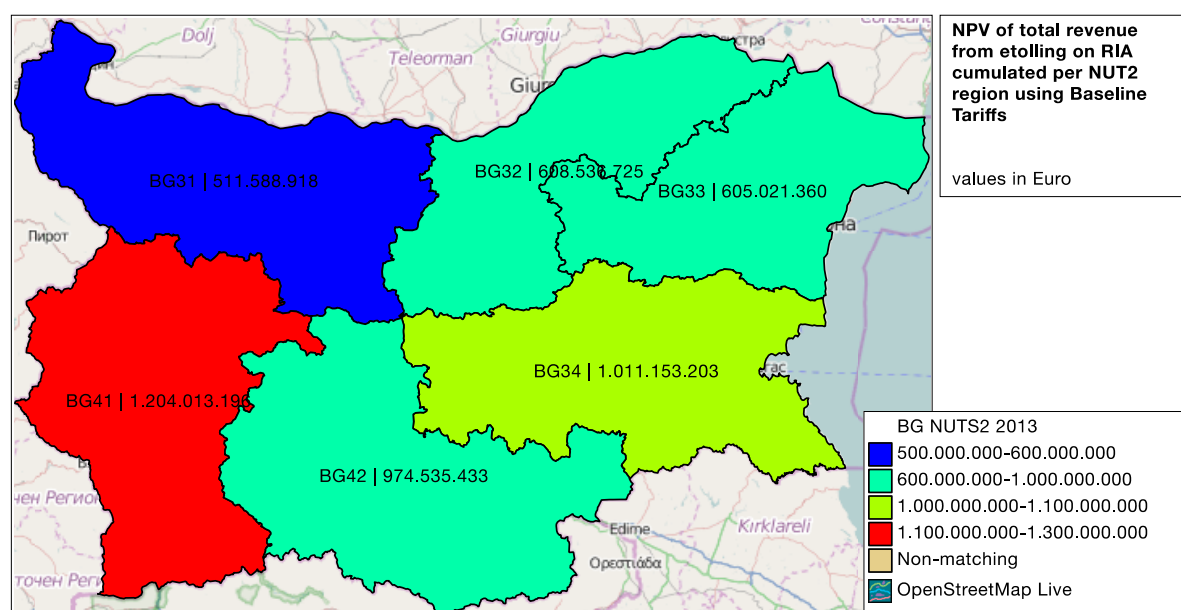


Figure 54. Net Present Value Example of Total Revenue from e-tolling on RIA Road Network (Motorway + 1st + 2nd + 3rd Class Road Network) Cumulated by Bulgarian NUTS2 Regions, Values in Euro



The motorway network (both existing and to be finished in 2015) shows most of the revenue ranging in the NPV value range above 75 Mio. EUR (see figure 33). The road corridors from Sofia to the south east (to Turkey) and to the north east but also to the south show the highest total NPV from e-tolling. Otherwise, the NPV values of e-tolling revenue are quite evenly distributed with some concentration at major Bulgarian cities. The NUTS region 41 (including Sofia) shows the highest cumulated NPV revenue from e-tolling, followed by the NUTS region 34 as shown in the Figure 54.

E Discussion on Sensitivity of Results

The financial model is a tool for option evaluation. At this stage it is not a pricing or revenue prediction model nor a business plan with cash flow analysis.

The areas of sensitivity are:

- **Toll rates for e-tolling and for e-vignettes.** These have been explicitly explored by vehicle type, road type and emission class (e-tolling distance based) and by e-vignette type (time based). Emission class splits have been chosen to reflect current data and penalise the “dirtiest” vehicles using Bulgaria’s roads. Although these are relatively few, a premium is still suggested to encourage movement to cleaner vehicles. As new emission classes are introduced, new classes can also be set up to further encourage adoption of these vehicles.
- **Traffic flows.** Based on available traffic counting a traffic model was developed. Expected traffic was forecasted using a combination of GDP growth, regional GDP, GDP to traffic elasticity and diversion of traffic due to pricing sensitivities. A rather conservative approach to traffic growth based on GDP was adopted. All traffic data is section based and geocoded to be used in combination with a GIS for visual representation.

- **Capital Expenditure (CAPEX) for the system.** This has been established using a range of benchmarked evidence from other schemes but will only be proven once a contractor submits a price. We will refine this as the design matures and through supplier engagement. However, as the Capex is typically less than one year's revenue, even doubling the cost will not change the NPV markedly.
- **Costs of on board units.** We have assumed current costs plus a conservative mix of fleet management units, but trends in costs continue to fall. Our OBU costs are therefore conservative.
- **Operational Expenditure (OPEX) for the system.** This is between 14% and 29% of the revenue and again based on benchmark with other recent systems. This is conservatively priced and will be refined in the next stages.

Overall and based on a combination of 18 scenarios, all figures suggest robust revenue streams can be achieved, even as costs are estimated. The true cost will only be known at the end of the tender/build phase and provided the correct toll tariffs are charged and enforced.

F Summary of Options against Targets

Making the target net revenue across 10 years and allowing for costs of borrowing etc means an NPV based approach gives a more robust overview. The following table shows average NPV in Mio BGN against the 400 Mio BGN target (Shown in green if greater than 400 or red if less).

| | 60% of recommended rates | Recommended rates | 130% of recommended rates |
|---|--------------------------|-------------------|---------------------------|
| Option 1 for e- vignette (150 BGN per annum) | | | |
| Motorway plus 1 st class roads | 343 | 512 | 639 |
| Adding second class roads | 412` | 663 | 851 |
| Adding third class roads | 465 | 776 | 1001 |
| Option 2 for e-vignette (97 BGN per annum) | | | |
| Motorway plus 1 st class roads | 266 | 435 | 562 |
| Adding second class roads | 336 | 586 | 774 |
| Adding third class roads | 389 | 700 | 932 |

This shows the trade-off between light and heavy charges, and road coverage. The key is that the target cannot be met unless:

- A low e-vignette price is combined with recommended heavy vehicle rates, although not all the network needs to be charged for heavy vehicles; or

- A high e-vignette price with lower heavy vehicle charges, but with additional roads charged for heavy vehicles

A low e-vignette and low heavy vehicle price will not give the revenue required. However, revenues can be increased in the life of the scheme by adding extra roads into the charged network and/or increasing rates.

20 Conclusions

The following general conclusions may be drawn:

- All 18 strategic scenarios deliver good returns on investment, most exceeding the notional 400 Mio. BGN target for annual net revenue, even when using a rather conservative NPV method. Most pay off the Capex element in the first year.
- However, looking at average NPV over the ten years suggests the low cost e-vignette plus low cost e-tolling option will not reliably meet this target. Hence either e-tolling or e-vignette charges need to be around the recommended level.
- Good returns can be achieved by using e-tolling rates for heavy vehicles that are lower than most comparable EU countries in early 2015, and e-vignette rates that are similar to the average across Europe. Reducing the rates to be as low as for example Poland would reduce revenue but still give substantial net revenue.
- This means there is some room for manoeuvre of rates if required later.
- Adding class 2 and 3 roads gives additional net revenue, as does increasing rates, but does increase risks to delivery because of the geographic scope of the system and poor public acceptance.
- Through the introduction of e-tolling and maintaining differential pricing between emission classes, the trend to “cleaner” trucks will continue. Especially larger trucks (weight ≥ 12 ton) will almost completely converge to cleaner emission classes (EURO III - V+) within the next couple of years. At this point, a new emissions rate may be needed.